ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LVIII, No. 3. CHICAGO, SATURDAY, JANUARY 21, 1911. ISSUED WEEKLY.

BY THE

ELECTRICAL REVIEW PUBLISHING COMPANY

CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall, Manager.

CHARLES W. PRICE.....Editor-in-Chief
A. A. GRAY.....Managing Editor
MORTON GITHENS LLOYD.....Technical Editor
F. H. BERNHARD.....Associate Editor
HOWARD EHRLICH.....Associate Editor
C. H. SEAVER.....Associate Editor

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back numbers, beyond one month, each . .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS 121
Wisconsin Electric Convention 124
Meeting of the Indiana Engineering Society.....124
National Electric Light Association 124
Edwin J. Houston.....125
The Electricity of Rain 125
Ohio Electric Light Association Convention.....126
Illinois Electrical Contractors' Association 126
National District Heating Association 126
New York City Rejuvenation of the Sons of Jove.....126
Plant of Julius Andrae & Sons Burns.....126
Wisconsin Telephone Meeting 126
Mail-Handling Plant in a New York Post Office.—By Joseph B. Baker..127
Convention of Bylesby Employees.....131
Chicago Electric Show 132
J. G. White and Denver Irrigation.....133
Canadian Electrical Commercial Committee.....133
Corona Discussed by American Institute of Electrical Engineers.....134
Changes in the Electrical Rules, New York City.....135
Memorial to John Chamberlain Fish.....135
New Wireless Stations in Italy.....135
The Electrical League of Cleveland.....136
Coal Briquet Industry of the United Kingdom.....136
Annual Convention of the Northwestern Cedarmen's Association.....136
Petroleum Produced in the United States in 1910.....137
Standards of Capacity.—By H. L. Curtis.....138
Electrical Requirements in Toledo 139
Spring Meeting of Electrochemical Society.....139
Western Society of Engineers.....140
St. Louis League of Electrical Interests.....140
Elements of Power-Station Design.—XX.—By W. B. Gump.....141
Extensive Use of Coal Briquets in Germany.....143
Production of Copper in 1909 143
Annual Meeting and Dinner of the Illuminating Engineering Society....144
Candlepower on Alternating and Direct Current.....144
Tantalum Lamps on Chicago Railway Cars.....144
Electric Lamps in the Navy.....144
New York Section, Illuminating Engineering Society.....145
Chicago Section, Illuminating Engineering Society.....146
The Neon Lamp 146
The Illumination Club of St. Paul, Minn.....146
The Proposed British Transatlantic Cable.....147
Wireless in the Navy.....148
Successful Results of Long-Distance Wireless Telegraphy in Italy.....148
Professor Jackson Engaged for British Telephone Investigation.....148
Electric Drive in Brass Mill.....149
An Electrochemical Cyanide Process.....150
A Unique Emergency Plant 151
Acylic Generators 151
FINANCIAL REPORTS OF ELECTRICAL COMPANIES.....152
Chicago Salesmen of Western Electric Company Have Annual Dinner..152
Electrical Vehicles at the New York Automobile Show.....153
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES.....154
CURRENT ELECTRICAL NEWS.....159
PUBLIC SERVICE COMMISSION NEWS.....160
RECORD OF ELECTRICAL PATENTS.....166

Copyright 1911 by the Electrical Review Publishing Company.

CORONA AND AIR INSULATION.

The paper presented by Prof. Harris J. Ryan at the meeting of the American Institute of Electrical Engineers last week, dealing with the facts and theory of corona and the electric strength of air, is a very valuable collection and discussion of the available experimental data on the subject and an attempt to co-ordinate them upon the basis of the ionization theory.

Professor Ryan's idea of the mechanism of the process is that the first leakage from a conductor at high potential is due to convection by the electrons or minute charged particles. In the case of a negatively charged conductor, the electrons (which are negative) are expelled from the conductor; in the case of a positive conductor, they are drawn in from the surrounding air. Corona does not appear until the energy of these electrons is sufficient to ionize the air molecules by impact; as soon as the air is ionized to a considerable degree it acts like a conductor, since the ions act, like those in an electrolyte, to carry the positive and negative charges in opposite directions through the electric field.

The fact that conditions around positive and negative conductors are different is evidenced by the work of Watson, who used continuous high voltages in his experiments and thus contributed the necessary supplement to the various researches which have been carried on with alternating voltages. The positive corona is uniform and close to the surface of the conductor, whereas the negative corona is irregular and farther from the surface. Its distance represents the corona striking distance, due to ionizing electrons projected outward. The positive corona arises from ionization due to electrons coming inward, which culminates next to the surface of the conductor.

Secondary ionization due to collision is then to be regarded as the fundamental feature of corona formation, according to this theory. It is significant that many of the previous results, somewhat contradictory on the face, are brought into correlation by the discussion on this basis. The irregularities which have been observed are attributed to the presence of radioactive emanations, ionized dirt, etc., on the negative conductor, which not only influence ionization, but produce local irregularities in the electric field. The critical voltage will be altered by the presence of radioactive bodies, by the presence of ionized air such as is

found near waterfalls, and other disturbing factors. For similar reasons, the electric strength of air has not a definite value, since it depends upon the state of ionization, as well as the distance separating the conductors and other physical conditions.

CO-OPERATIVE ADVERTISING.

At a recent meeting of the Electric Club of Chicago, Mr. H. H. Cudmore, president of the Electrical League of Clevelang strongly endorsed the idea of co-operative advertising in daily newspapers upon the part of the electrical interests of our big cities. For some time the prominent distributors of electrical appliances in Cleveland have subscribed to a "People's Electrical Page" which has appeared at regular intervals in one of the more prominent Cleveland newspapers. This idea has been carried out for the past two years, and it is understood that the returns have been so satisfactory that it is now intended to go into another newspaper and publish this page twice a week. This advertising is participated in by dealers in all kinds of electrical material, and by wiremen, repairmen, and the local illuminating company.

Electrical apparatus has not been considered the subject of advertising to the general public, largely because the distribution of this material has been through several well defined and segregated lines. With the development of numerous accessories in the shape of domestic utensils, with the large increase in the number and improvement in the character of reflectors and portable lamps, with the growing appreciation of the public with respect to the electric fan and similar apparatus, there has grown up in the minds of the local dealers in electrical apparatus an appreciation of the necessity of appealing more directly to the public. This is, of course, good in the long run for the manufacturers of this apparatus, but except in those cases where the manufacturers deal directly with the public they have not seen the wisdom nor the logic of appealing directly to them no more than any other wholesaler or manufacturer dealing with any other commodity for ultimate consumption by the general public. Certainly there can be no doubt of the propriety of the local dealers in electrical apparatus appealing to the public through the same mediums as other distributors of commodities which are used directly by the buying public, and just so certain is it that where this advertising is published collectively and the advertising character of the announcements is embellished by reading material which gives further information respecting the manifold uses of this apparatus, the benefits will be materially increased.

The suggestion has been made that the dealers in electrical appliances in Chicago look into the possibilities of this co-operative advertising and the idea will no doubt spread to many other of our big cities. As a matter of fact, the idea is not new and has been worked out along somewhat similar lines in other places. We do not wish to impose nor suggest any additional burdens whatever in the shape of advertising upon the manufacturers of electrical material, but it does seem that the scheme now being carried out by the Cleveland electrical people is worthy of consideration by others similarly situated in every part of the country, for what we most desire is the building up of new business and every time we interest a new consumer in the utilization of electrical energy we are helping to build up the resources of and the demands for material from everyone engaged in the production of electrical apparatus.

MEASURING THE SMOKE NUISANCE.

In a paper read at the Minneapolis meeting of the American Association for the Advancement of Science, Prof. George B. Frankforter described some experiments in which measurements were made of the amount of soot and cinders which was precipitated in the city of Minneapolis during a period of some five weeks. The amount of this deposit is rather surprising and its quantitative measurement gives one a much more definite idea of the amount of smoke which is projected into the air in our large cities than anything else could do. It is stated that one gram of unburned carbon fell on each square foot of the city's surface during the time of the experiment. As the areas examined were typical of the entire city it will be readily understood that the total deposit over the city would mount up into a large aggregate, which is stated to be in the thousands of tons.

In cities of larger extent and denser population than Minneapolis one may readily believe that the deposits of this kind would be greater and it is very evident in certain localities that they are. We have been in the habit of thinking of the objections to smoke in terms of health, cleanliness and beauty, but the magnitude of these results calls our attention to the fact that the smoke represents a large value of unburned fuel which is being continually wasted. The smoke nuisance therefore represents a direct commercial loss, as well as an economic waste from the other points of view mentioned.

A committee of the Cleveland Chamber of Commerce has estimated that the damage done in that city amounts to twelve dollars per capita per annum, considered only from the point of view of the deterioration of property from the dirty deposits and the work in cleaning which is necessitated at the same time.

If we consider the actual waste in the value of the unconsumed fuel this quantity will be raised to an even higher value and its aggregate for every large city would amount to many millions of dollars.

The chief offenders in this respect in every large city are the railroads, and pressure should be brought to secure the electrification of the terminals, at least, wherever possible. Although this country was a pioneer in the electrification of steam railroads, we are in danger of being left behind in this movement, as active efforts are in progress in Europe to this end.

ELECTRIC COOKING FOR DINING CARS.

While electric car-lighting has become general in this country for through service, it is seldom used for short runs, unless possibly in Pullman cars. Its use has been furthered mainly from considerations of convenience, comfort and elegance. Its use should be more widely extended from considerations of safety, as the carrying of tanks of gas becomes dangerous in case of a wreck. This danger arises not only from gas carried for lighting but also from that carried on dining-cars for cooking purposes.

The necessity of substituting electricity for gas in both train lighting and train cooking has been again brought forcibly to notice by the accident at Hawes Junction, England, just before Christmas. After the collision the wreck was set on fire by the gas carried in the dining car for cooking purposes and the flames spread to the other cars.

As this is a matter concerning primarily the safety of passengers, steps should be taken by the Interstate Commerce Commission leading up to the final abolition of gas for any purpose in train service. Electric cooking today has been sufficiently developed so that no difficulties stand in the way of its general application for this purpose. The use of current involves no danger, especially if the source is a low-voltage battery, such as is commonly used for service in train lighting.

DELETERIOUS EFFECTS OF LIGHT UPON THE EYE.

The two papers presented at the meeting of the New York Section of the Illuminating Engineering Society, pertaining to glare and ocular discomfort, bring several aspects of the physiology of the eye to attention in a way that has not been generally considered heretofore.

In his discussion on glare, Dr. Percy W. Cobb shows that this effect is due at least in part to the scattered light which is distributed over the retina from any brilliant source which may be in the field of view. That the blinding effect of a bright source is not directly due to the sensation produced by its own image on the retina is shown by the fact that when this image falls upon the blind spot the effect is greater than in some of the other cases examined in the experiments. The entire effect of glare, however, cannot be attributed to this scattered light. Dr. Cobb's experiments indicate that visual acuity is reduced by intense sources situated even as far as ninety degrees from the object upon which vision is directed.

The theory advanced by Dr. Nelson M. Black as to the mechanism of vision supposes that the sensation received is due to a photo-chemical change in the purple matter of the retina, the sensation being proportional to the rate at which this chemical change is produced. If the yellow and green rays are the most efficient in producing this chemical change, the fact that the maximum sensibility of the eye is in this part of the spectrum would be explained. The reduced sensibility of the eye after exposure to bright light would also be explained, since it would take some time for the formation of fresh supplies of the visual purple.

The theory advanced by Dr. Black gives no explanation of the ability of the eye to detect different colors since the difference in the chemical change in the visual purple with frequency of the impinging light is simply one of magnitude.

This paper emphasizes the fact that very little if any ultra-violet light can penetrate to the retina of the eye, and that the activity of such rays in producing ocular discomfort or disorder of the eye has probably been overestimated.

These additions to our knowledge of the effect of illumination on the eye will contribute very much to a general appreciation of the conditions existing and of the conditions which should be avoided in the use of artificial illumination.

A SERIOUS ELECTRIC-RAILWAY SITUATION.

A serious condition of affairs is indicated in the electric-railway industry of Massachusetts by the preliminary report of the Board of Railroad Commissioners for the nine months ending June 30, 1910. Out of seventy-eight companies filing reports of operations with the Commissioners, only thirty-five paid dividends, and only five paid seven per cent or over. One company paid 10 per cent; three, 8.0 per cent; one, 7.22 per cent; seven, 6.0 per cent; and one, 5.5 per cent. Yet the operation of the roads was conducted with high administrative skill, the ratio of expenses to earnings being 0.67, or less than the ratio of six years out of the past nine. The cultivation of traffic is evident in an increase in the gross earnings per car-mile from 27.19 cents in 1909 to 27.39 cents in 1910. It is well known that the companies have striven hard to economize in operation, but despite their efforts, which have been felt from the president's office to the track department, the expenses per car-mile rose from 17.8 cents to 18.45 cents. Special efforts have been made to fit the car service of large systems to the traffic needs, but with all these attempts to offset the increased cost of living to the railway, it is a significant result that less than half of the companies paid any returns to their stockholders, while only five paid what might be called a reasonable return—seven per cent or over.

Nothing is plainer than that this sort of showing cannot continue if the transportation service of the old Bay State is to be maintained at its present standard of efficiency, since money for needed improvements simply cannot be secured unless a return which is genuinely attractive to capital is substantially guaranteed. The movement toward increased fares and the reduction of free-transfer facilities which began three years ago must evidently be carried further, and there ought to be little objection to this on the part of the intelligent public.

WISCONSIN ELECTRICAL CONVENTION.

OPENING SESSION AT MILWAUKEE.

(Special Dispatch to the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.)

MILWAUKEE, WIS., January 18, 1911. —The convention of the Wisconsin Electrical Association opened here this morning at the Hotel Pfister with George B. Wheeler in the chair. President Smith was incapacitated by illness. The report of the secretary and treasurer was read. The first paper of the meeting was one by Ernest Gonzenbach, of Sheboygan, entitled "Publicity Campaigns." This considered the best methods of reaching the public, and was followed by a brief discussion. The remaining sessions of the convention will be reported in our next issue. H. E.

Rejuvenation of the Sons of Jove in Chicago.

A very enjoyable rejuvenation and joviation was held by the Sons of Jove in Chicago, under the direction of George H. Porter, Statesman for Illinois; R. M. Van Vleet, Mercury, and E. D. Strickland, Assistant to Jupiter. A well appointed dinner was discussed prior to the initiation of new candidates and brief remarks were made by W. H. Colman, General Electric Company; F. S. Hunting, Fort Wayne Electric Works; George S. Searing, R. M. Van Vleet, George H. Porter, W. A. Stacey, W. N. Matthews, Frank L. Perry, W. L. Womack, David Aitken, Glenn Webster, James G. Pomeroy and P. R. Boole.

Forty-two candidates were entered into the Order, and a fitting message sent to Jupiter. Messages of regret were received from John F. Dostal, Ninth Jupiter, and from J. Robert Crouse, Seventh Past Jupiter. The committees included C. A. Howe, membership; P. R. Boole, finance; W. S. Taussig, banquet; and A. A. Gray, publicity. The toastmasters were F. P. Vose and A. A. Gray.

Preliminary to the introduction of the first speaker, Mr. Vose made an excellent address on the features of Jovianism and the characteristics which appertain to the Order for the furtherance of good fellowship and the development of fraternity throughout the electrical industry.

Meeting of the Indiana Engineering Society.

The annual meeting of the Indiana Engineering Society was held in the Denison Hotel, Indianapolis, January 12, 13 and 14. It was well attended, the registration being the largest in the history of the society.

In calling the meeting to order President E. E. Watts congratulated the membership for the progress made during the past year and urged that a greater effort be made to interest the younger men of the profession in the society. He pointed out needed legislation and advocated that a law be enacted requiring engineers to pass an examination.

An interesting paper was read by Frank R. Daniels of Indianapolis, on "The Ravages of Electrolysis." Mr. Daniels said that electrolytic action, of the kind which in the past, has done much damage to underground pipes, can be checked and practically eliminated by careful study of conditions and by the application of modern processes of insulation and conduction. He also said that, owing to the large losses suffered by electric lines from theft, the majority of roads are adopting the welded rail bond, instead of the type that can be removed and sold.

Charles A. Tripp, of Indianapolis, made a report of the Committee on Electrical Advancement. He said that a review of the last year's advances in electrical construction was not as great as desired, but while little or no new inventions had been placed on the market the advance in electrical equipment had been steady and remarkable, the units now being built greatly exceeding other years' products in size and number. The development of the tungsten light, the introduction of heating and cooking fixtures, and the manufacture of larger generators were given as the most prominent advances of the year in the electric field. Mr. Tripps said that in his opinion it was impossible for electricity to compete with gas as a fuel except on a rate of two cents a kilowatt-hour.

Mr. Tripp followed the reading of his report by reading a paper on "Individual Electric Drives Applied to Textile Mills."

The officers elected for the ensuing year are President, D. T. Luten, Indianapolis; vice-president, M. A. Howe, Terre Haute; secretary, Charles Brossmann, Indianapolis.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

ANNUAL CONVENTION, NEW YORK, MAY 29-JUNE 3. NO COLLECTIVE EXHIBIT. URGE DEVELOPMENT OF WATER POWER.

The executive committee of the National Electric Light Association at its recent meeting in New York City decided to hold the annual convention in New York City, from May 29 to June 3, with four days of business sessions, in the Engineering Societies Building, 33 West Thirty-ninth Street. No specific hotel headquarters have been established. The recommendation of the Exhibition Committee to omit the usual collective exhibit was adopted, but it is likely that there will be a number of individual exhibits by manufacturers.

The executive committee discussed the question of the development of the water-power resources of the country and then passed the following resolutions:

WHEREAS, the condition of the laws and regulations relating to the public lands of the United States Government is so complicated, unsatisfactory and unsettled that the financing and commercial development of new enterprises in connection with public lands is rendered practically impossible; and

WHEREAS, the immediate development of the idle water powers of the nation is of importance to the whole people in that it brings to immediate use an indestructible natural resource that would be otherwise lost or idle, and conserves coal, oil, gas and other fuels that are limited in amount and not subject to replacement; and

WHEREAS, the National Electric Light Association is particularly interested in the situation pertaining to public lands of the United States in connection with the development of water powers; and

WHEREAS, much of the difference of opinion upon the subject of water power arises from the difficulty of obtaining a clear comprehension of all the facts;

NOW, THEREFORE, BE IT RESOLVED: That this Association does respectfully urge that a competent commission, composed of members of the Senate and House of Representatives of the United States, together with other persons familiar with the financial and other practical aspects of the situation, be appointed with full authority to collect the evidence, and for that purpose to hold full and complete open hearings in different sections of the country; and be it further

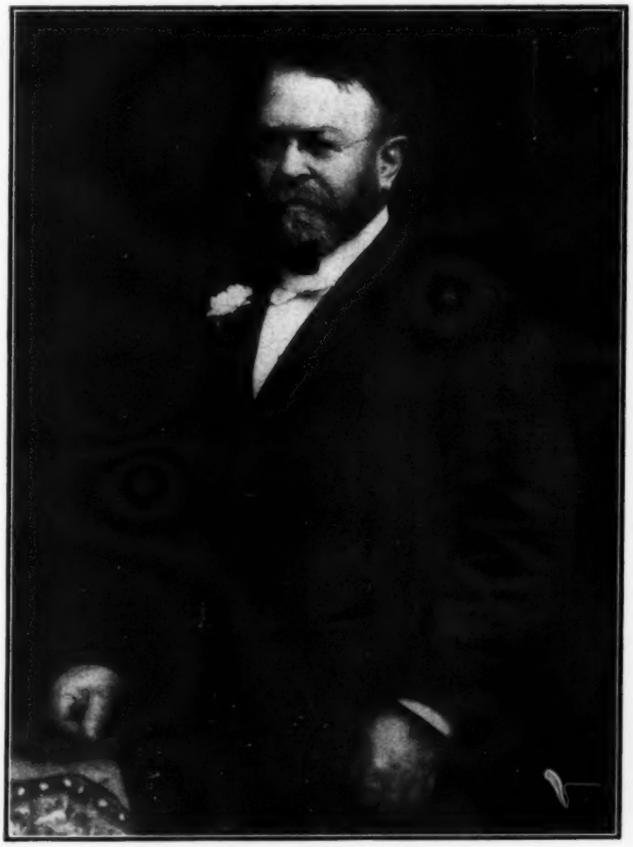
RESOLVED: That this Association does respectfully urge that such commission be appointed at as early a date as possible to the end that its meetings may be held between the adjournment of the present session of Congress and the reassembling of the new Congress in the hope that such commission should report upon such reassembling and Congress be thereby enabled to take prompt action in the enactment of such laws as will permit the development of the natural resources of the country in such a manner as shall render them of the greatest possible use to all of the people.

Edwin James Houston.

From the earliest days of the practical application of discoveries relating to electrical phenomena, the name of Houston has borne great prominence. Associated with Elihu Thomson in the invention and development of the Thomson-Houston system of arc lighting, Mr. Houston has stamped his name and fame indelibly upon all of the records having to do with progress in our field.

Edwin James Houston was born at Alexandria, Va., July 9, 1844, the son of John Mason and Mary (Larmour) Houston. He received the degree of Bachelor of Arts from the Central High School of Philadelphia in 1864, later receiving from the same institution the Master's degree. He is an honorary Ph. D. of Princeton University. He is emeritus professor of physical geography and natural philosophy in the Central High School, emeritus professor of physics of Franklin Institute, professor of physics of the Medico-Chirurgical College, and also engaged as an electrical expert and consulting engineer.

Dr. Houston was a member of the United States Electrical Commission and chief electrician of the International Electrical Exhibition in Philadelphia in 1884. He is a member of the American Institute of Mining Engineers, the American Philosophical Society and many other scientific and engineering organizations, and was president for two terms of the American Institute of Electrical Engineers.



EDWIN J. HOUSTON,
Professor, Inventor, Author.

Dr. Houston has contributed very liberally to technical literature and his bent in this direction is remarkable. His work as an author covers a wide range of topics and the appended list indicates only in part the many contributions from this versatile mind: Outlines of Natural Philosophy; Easy Lessons in Natural Philosophy; The Electric Transmission of Intelligence; The Measurement of Electric Current; Electricity and Magnetism; Electricity One Hundred Years Ago and Today; Electricity Made Easy; Electro-Dynamic Machinery; Recent Types of Dynamo-Electric Machinery; Elements of Physical Geography, 1878, 1904; Intermediate Lessons in Natural Philosophy, 1881; Primers of Electricity, 1884; International Electric Exhibition of 1884; Short Course in Chemistry, 1884; Electric Furnaces, 1888; Primers of Forestry, 1891; Outlines of Forestry, 1893; Dictionary of Electrical Words Terms and Phrases, 1894; Electric Engineering Leaflets, 1895; Elements of Natural Philosophy, 1897; Algebra Made Easy (with Arthur E. Kennelly), 1897; Alternating Currents, 1897, 1906; Arc Lighting, 1897, 1906; Electric Heating, 1897, 1906; Electric Motors, 1897, 1906; Electric Railways, 1897, 1906; Electro-Therapeutics, 1897, 1906; Incandescent Lighting, 1897, 1906; Magnetism, 1897, 1906; Telegraphy, 1897, 1906; Telephony, 1897, 1906; Elements of Chemistry, 1898; Pocket Electrical Dictionary, 1898; Interpretation of Mathematical Formulæ, 1898; Electricity in Every-Day Life, 1904; Franklin as a Man of Science, 1906; The Boy Geologist, 1907; The Boy Electrician, 1907; The Wonder Book of Volcanoes and Earthquakes, 1907; Wonder Book of the Atmosphere, 1907; The Search for the North Pole, 1907; The Discovery of the North Pole, 1907; Cast Away at the North Pole, 1907; In Captivity in the Pacific, 1907; Wonder Book of Light, 1908; Wonder Book of Magnetism, 1908; Five Months on a Derelict, 1908; Wrecked on a Coral Island, 1908; At School in the Cannibal Islands, 1909; A Chip of the Old Block, 1910. Other works are in preparation at the present time.

The Electricity of Rain.

Extensive observations made by G. C. Simpson in India lead to the following conclusions: (1) The electricity brought down by rain is sometimes positive and sometimes negative. (2) The total quantity of positive electricity brought down is 3.2 times the total quantity of negative. (3) The period during which positively charged rain fell was 2.5 times the period during which negatively charged rain fell. (4) Treating charged rain as equivalent to a vertical current of electricity, the current densities were generally smaller than 4×10^{-15} amperes per square centimeter, but on a few occasions greater current densities, both positive and negative, were recorded. (5) During periods of rainfall the potential gradient was more often negative than positive, but there were no clear indications of a relationship between sign of charge on the rain and the sign of the potential gradient. (6) Negative currents occurred less frequently than positive currents. (7) The charge carried by the rain was generally less than six C. G. S. electrostatic units per cubic centimeter of water, but larger charges were occasionally recorded. (8) The data do not suggest that negative electricity occurs more frequently during any particular period of a storm than during any other. (9) With rainfall of greater intensity than 0.3 millimeter per minute the positive charge carried was independent of the rate of fall.

Ohio Electric Light Association Convention.

The executive committee of the Ohio Electric Light Association held its annual meeting at the Chittenden Hotel in Columbus, O., January 11. The committee selected Cedar Point, O., as the place for the next annual convention, with headquarters at the Hotel Breakers, the time to be Tuesday, Wednesday, Thursday, and Friday, July 25, 26, 27, and 28, 1911. The excellent entertainment and large attendance at the convention of 1910 induced the committee to return to this point for the 1911 convention.

The convention this year will be even more elaborate in the way of program and entertainment than that of 1910, which was the high-water mark reached by State electric conventions in the United States. Twelve subjects will be considered at this convention, as follows:

"Report of the Committee on Motor Applications"; "Report of the Committee on Electrical Transmission"; "Report of the Committee on Meters"; "Ornamental Street Lighting," by O. H. Hutchings, of the Dayton Lighting Company; "Mercury-Arc Rectifiers, Their Installation and Care," by J. T. Kermode, of the Cleveland Illuminating Company; "Systematic Central-Station Records," by O. B. Reemelin, of the Dayton Lighting Company; "Motor-Driven Refrigeration," by W. C. Anderson, of the Canton Electric Company; "Development of a Central Station in Small Cities," by S. M. Rust, Greenville Electric Light and Power Company; "Pumping Water for Municipalities and for Irrigation by Electricity," by B. H. Gardner, of the Dayton Lighting Company; "The Use of Tungsten Lamps in Sign and Outline Lighting," by W. B. Gowdy, East Liverpool Traction and Light Company. One paper by W. E. Richards, of the Toledo Railway and Light Company, subject to be announced later. There will also be report by the Secretary of the investigation of insurance rates charged in Ohio, and for fire and liability. This report will also give the money this insurance is costing and the losses for the past five years.

The association will publish its souvenir program as in the past, which has each year proved a magnificent success, both as a means of creating interest and in defraying the expenses of the convention.

Three banquets will be given by the association on the three nights of the convention to all attending, and there will be an elaborate entertainment for the ladies. Mrs. Clara Turpen Grimes, soloist, whose singing was so greatly enjoyed during the 1910 convention has consented to return for 1911.

The committee on general arrangements consists of E. A. Beckstein, Sandusky; T. D. Buckwell, Toledo, and W. J. Hanley, Cleveland, O.

Full information may be had by writing the secretary, D. L. Gaskill, Greenville, O.

Illinois Electrical Contractors' Association.

The annual convention of the Illinois Electrical Contractors' Association was held at the Hotel La Salle, Chicago, Ill., Saturday, January 14, with an attendance larger than at any previous meeting of this organization.

The morning session was called to order by President Staff promptly at 10 a. m. This session was given over largely to informal discussions on the experiences of the members in handling time and material work, details of estimating, experiences on cost, etc. At this session the Association elected an additional director as a representative to the National Electrical Contractors' Association, this action being taken in view of the addition of ninety-six new members to the State Association. President S. E. Staff was unanimously elected.

The morning session was concluded with the selection of Bloomington, Ill., as the place for the next meeting in June. It was also decided to extend the meetings over a period of two days, owing to the size of the organization and the additional business to be transacted.

The afternoon session was in the nature of a revival meeting. Practically every member present was called upon to recite his experience in the business and to offer suggestions as to the better methods to adopt. Several contractors gave their experiences as to the handling of various materials and the placing of them.

An important phase of this session was the comprehensive address of G. M. Sanborn, former president of the National Electrical Contractors' Association. Mr. Sanborn covered fully the various phases of the overhead costs of contracting. At this session seven applications for membership were acted upon.

In the evening an informal banquet was held in the Palm Room of the Hotel La Salle. C. R. Kreider acted as toastmaster. The principal speakers were Joseph R. Strong, of New York, who delivered a very interesting address on "The National Association," and E. McCleary, of Detroit, who spoke on the subject of contracting as a business.

National District Heating Association.

The annual meeting of the National District Heating Association will be held at Pittsburg, Pa., June 6, 7, and 8, with headquarters at Fort Pitt Hotel.

The subjects announced are as follows: "Radiators and Their Treatment"; Report of the Committee on Data," which will include rates and other data pertaining to the heating business; "Report of the Committee on Meters"; "Report of the Committee on Radiation"; "Results of Measuring Station Load by the Venturi and General Electric Meters"; "Heating Franchises," and five other papers, subjects to be announced later.

The secretary of the association is D. L. Gaskill, Greenville, O.

New York City Rejuvenation of the Sons of Jove.

A rejuvenation and joviation of the Sons of Jove will be held at Reisenweber's, Fifty-eigth Street and Eighth Avenue, New York City, January 30, 1911, at 6:30 p. m. The joviation and rejuvenation will be in charge of George Weiderman, Neptune, and Assistant Statesman Joseph F. Becker, 1170 Broadway, New York.

Plant of Julius Andrae & Sons Burns.

On Saturday, January 7, the electrical supply house of Julius Andrae & Sons, Milwaukee, Wis., was almost totally destroyed by fire. The stock lost is said to be valued at $200,000, while the building could not be duplicated for less than $35,000.

Work has been commenced on new quarters and the Company is at present filling orders as usual.

Wisconsin Telephone Meeting.

The annual meeting of the Wisconsin State Telephone Association will be held at Madison, February 1 and 2. In connection with the convention there will be exhibits, and arrangements are being made for a suitable hall.

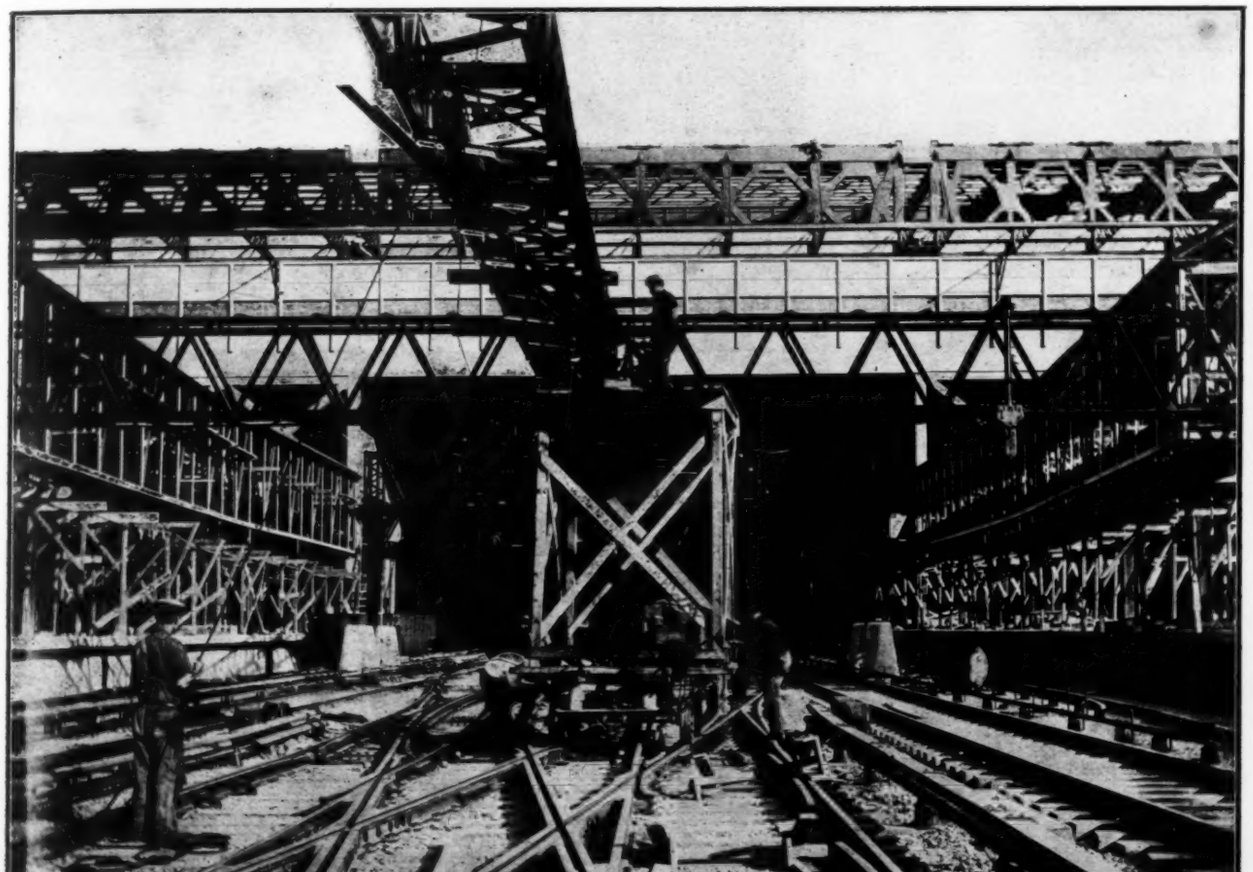
Mail-handling Plant in a New York Post Office.

Electrically Operated Plant in the Pennsylvania Railroad Station.

BY JOSEPH B. BAKER.

An ingenious and unique electric motor-operated mail-handling system, installed in the new Post Office Building that is being erected in connection with the new Pennsylvania Railroad station, Manhattan, New York City, was started up Saturday night, November 27, and has since operated substantially without a hitch and with entire satisfaction.

The Post Office Building, situated west of the station, designed as the terminal of an electric train service through the twin tunnels that carry the Pennsylvania system under the Hudson River in the west, and under the East River to Long Island, follows the same architectural plan, in that it stands over and astride of the trackage. Directly underneath the building are certain tracks and platforms appropriated to postal use, viz., six tracks adjacent to four track platforms, used for outgoing and incoming mail trains and for passenger trains containing one or more mail cars. The new terminal handles no less than forty per cent of the total tonnage entering and leaving New York City. Further, the layout of the station as the terminal of an underground system has not only meant limited space in which to install the means of handling the mail, but has also limited the time allowable for dealing with train movements. These circumstances have made the design of an adequate mail-handling scheme an engineering problem of extraordinary difficulty, and to Mr. Woodwell, of the firm of L. B. Marks and J. E. Woodwell, consulting engineers, of New York City, is due the credit of solving the problem with entire success.



VIEW LOOKING EAST FROM MAIN SIGNAL TOWER TOWARD POSTOFFICE BUILDING, SHOWING AT RIGHT AND LEFT THE OVERHEAD BELT CONVEYOR STRUCTURES FOR DELIVERING ON THE TWO ISLAND PLATFORMS.

Mr. Woodwell's achievement is an expression of his individuality as a systematic and resourceful engineer of the modern type, accustomed to large enterprises. He had already demonstrated special ability in other Government work, notably in the Treasury Department. Mr. Woodwell was born

at Wells, Maine, January 7, 1874, attended high schools in Massachusetts, and graduated from Massachusetts Institute of Technology in the Department of Mechanical Engineering, the youngest member of his class, in 1896. The mail-handling problem was entrusted to him by committees representing the Pennsylvania Railroad, the architects of the station and Post Office buildings (McKim, Mead & White, for whom his firm are consulting engineers), and the Railway Mail Department of the United States Post Office.

The new terminal possesed the usual paraphernalia for handling mail pouches as found in modern railroad stations. Departing mail may be delivered, and arriving mail received, in connection with the underground trains, *via* a subway twelve feet wide and twenty-two feet high running for a distance of nearly 1,000 feet east and west under one of the tracks, with adequate lateral branches. New York City mail, brought to the Post Office in wagons, is sent down to the basement and track levels, and to the subway, by plunger elevators, which are also used for lifting the incoming bags. A large number of motor trucks, of 4,000 pounds capacity, have been provided, and the elevators, which are electric motor operated, are of sufficient size and capacity to raise and lower loaded trucks between the different levels.

OVERHEAD BELT TRIPPER IN OPERATION, SHOWING CLUTCH FOR AUTOMATIC PROPULSION OF TRIPPER.

These facilities, which would be ample to handle the mail going through a good-sized modern railroad station, are not sufficient to take care of the mail which arrives at, and departs from, this metropolitan terminal. Between 250 and 300 tons of mail are handled daily, comprised in 12,000 to 16,000 pouches.

The temporary quarters just now available in the Post Office Building comprise a "mailing floor," two feet above the level of the private street, a "basement" one story down, fitted up like a group of standard "R. P. O." cars and devoted to the repouching, re-

J. E. WOODWELL CONSULTING ENGINEER OF THE MAIL-HANDLING SCHEME.

sorting and distribution of the mail, and still further down, the track platforms on the tunnel level. These three floors constitute the location of the plant of conveying machinery, which is divided into two distinct parts, for handling outgoing and incoming mail, respectively.

The special equipment for handling the outgoing mail, constituting eighty per cent of the total tonnage passing through this Post Office, consists of spiral chutes (with double, triple and guadruple compartments), elevators and newspaper slides between the different main levels, and overhead conveyors operating horizontally between the basement and the track level, for the final delivery of the pouches in the cars. The spiral chutes run to all four of the postal track platforms and deliver the mail bags, emerging from the openings at their lower ends, to motor-driven overhead conveyor-belts. Take, for example, the progress of a lot of bags dropped into one of the double chutes: One compartment of this chute delivers to a conveyor-belt which is continuously moving westward, from the foot of the chute, for a considerable distance out along the track platform, and the other compartment delivers to an eastwardly moving belt. We will say that the bags are destined for a car standing out in the yard to the west of the building. The man in charge of loading this car operates a loading machine or "tripper" designed to skim the bags off the belt and drop them in at the door of the car through a flexible spout. The tripper consists of a set of idler pulleys through which the belt runs, and is mounted on a carriage with motor-operated, self-propelling gearing, clutches, and control levers and buttons, and running on three rails. One of the idlers is so arranged above the moving belt that a pouch traveling along on the belt on reaching the idler is caused to ride up over the idler, where it is deflected by a guide and is delivered into the spout attached to the tripper. The only manual operation, therefore, is the setting of the tripper and the inserting of its spout into the door of the car; when this is done, the stream of bags pours in at the door of the car, there to be stowed away by the car man.

Incoming mail is handled by a separate plant, affording horizontal transportation along underneath one of the track platforms and delivering to a bucket elevator for vertical transportation to the upper floors. There are two underground conveyor-belts running in opposite directions to their common de-

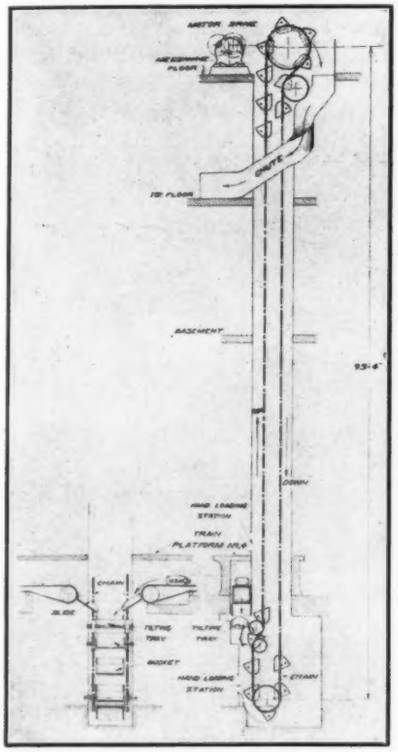
OVERHEAD CONVEYOR-BELT IN OPERATION WITH SLIDE SET AT MAIL CAR.

livery point at the foot of the bucket elevator. Incoming mail trains are shunted to this platform, which is equipped with "loading stations" leading to the conveyor. The bags are simply thrown from arriving cars on to the platform, and dragged or trucked to the nearest loading station, which

has a trapdoor opening. When a bag is thrown in, it lands not on the moving belt directly, but on a shelf, from which it is automatically delivered to the belt by a pneumatically controlled time-element apparatus designed to deliver the bag at just the right instant to one of the rising buckets, to avoid all risk of injury by crushing or spilling.

OVERHEAD BELT CONVEYORS.

All motors for the eight overhead belt conveyors for outgoing mail were supplied by the Diehl Manufacturing Company, being of the self-enclosed type, designed for 650-volt direct current, operating at a normal speed of 675 revolutions per minute, and arranged to



SIDE ELEVATION AND PLAN OF CO-ORDINATED BELT CONVEYOR AND BUCKET ELEVATOR MECHANISM FOR HANDLING INCOMING MAIL

secure a speed control of twenty per cent above the normal speed by shunt field control and a decrease of twenty per cent below normal by armature resistance. The motors are capable of developing the following rated horsepowers when operating at a maximum speed of twenty per cent above normal:

Track Platform No. 4: West belt, 73 feet long, 5 horsepower motor; East belt, 185 feet long, 7½ horsepower motor.

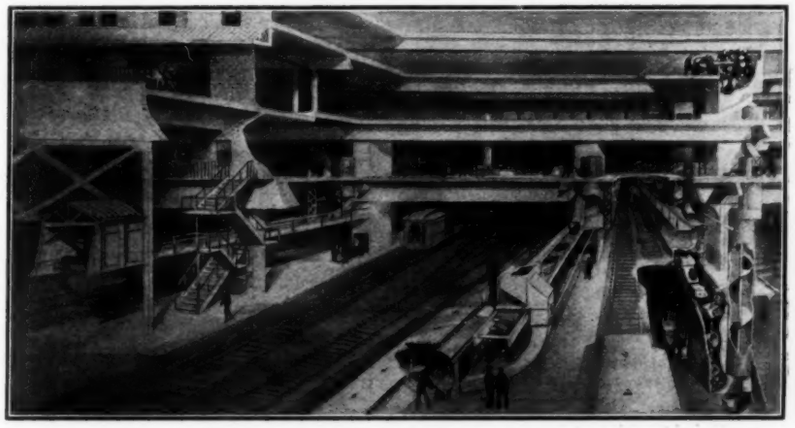
Track Platform No. 8: West belt, 65 feet long, 5 horsepower motor; East belt, 195 feet long, 7½ horsepower motor.

Track Platform No. 13: West belt, 192 feet long, 10 horsepower motor; East belt, 60 feet long, 5 horsepower motor.

Track Platform No. 14: West belt, 192 feet long, 10 horsepower motor; East belt, 60 feet long, 5 horsepower motor.

Each of the motors is equipped with a Cutler-Hammer inclosed drum-type non-reversible, compound controller, having no-voltage, overload, and push-button release features. The controllers are designed for 650-volt operation with resistance designed to secure the field and armature speed control above mentioned. The controllers and the operating features are mounted in pairs upon a blue Vermont marble panel having a substantial sheet-iron cabinet located above the controller. In the cabinet are installed a main line switch, two motor switches for each motor equipment, and overload, no-voltage and push-button release coils. The individual motor drive for each of the eight belt conveyors consists of two reductions between the motor and the conveyor-belt driving pulley. The first reduction between the motor and the countershaft consists of a Renolds silent chain drive, and the second reduction between countershaft and driving pulley is made with spur gears. The entire drive is rigidly mounted upon the structural members supporting the conveyors. The bearings of the countershafts and the driving pulleys are of the self-alining oil-ring type with renewable bronze shells and pedestals of cast iron, designed with oil pockets, oil fillers, brass-mounted oil gauges, and draw-off cocks. The shafts are fitted with end-thrust safety collars bearing against turned shoulders on the shafting. The spur gears are designed with extra long hubs keyed to the shaft, each key being locked with two cup-set screws. The spur gears are of cast steel with cut teeth of extra wide face, and the pinions are of forged steel with teeth cut from the solid. The sprockets for the chain drive are of cast iron and motor pinions of steel, both specially adapted for the Renolds chain. The motors are mounted on 4 by 6-inch filled and varnished dressed oak skids securely bolted to the motor platform. Under each motor is placed an oil-tight galvanized-iron drip pan extending under the entire motor and bearings.

A hand lever operates the controller for bringing each motor to the desired speed. In case of abnormal load on the motor due to too rapid starting, or to clogging of the driving mechanism, the overload release coil will cause the solenoid switch to be opened, and this switch will not close again until the controller lever has been returned to the off position. Push-button release stations are located along the gangway of the conveyor structure for the respective belts at intervals of approximately forty feet. By pressing a button at any one of those stations, the release coil becomes energized and causes the main-line solenoid switch to be opened in the same manner as for the overload device. In event of failure of the current supply, the no-voltage release feature is brought into action, opening the main-line solenoid switch, which protects the motor from inrush of current should the current supply be restored before the controller handle is moved to the off position.



PICTORIAL SECTION OF MAIL-HANDLING EQUIPMENT IN OPERATION.

BUCKET LIFT AND UNDERGROUND BELT CONVEYOR.

The motive power for the bucket lift,

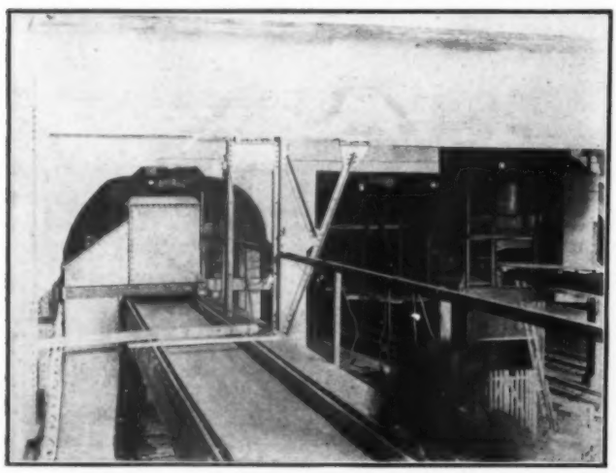
including the operation of the belt conveyors under track platform No. 4, the pneumatic belt-loading mechanisms and valve-control mechanism, is centered in a single electric motor drive located at the mezzanine floor of the Post Office, i. e., at the top of the bucket elevator shaft. As it was necessary to locate the bucket chain take-up mechanisms at the top or driving end of the bucket lift, a combination bevel and spur gear drive was adopted. This drive consists of a fifty-horsepower motor with a forced steel cut pinion, driving two parallel countershafts through a train of cast-steel gears and forged-steel pinions, the second shaft driving a third countershaft through a pair of miter gears at the driven end and a bevel gear on the driving end, engaging with a large bevel gear of approximately sixty-nine inches pitch diameter mounted upon the main or head shaft of the bucket lift. To permit the rise and fall of the main bearings without changing the centers between the head shaft and second countershaft, the intermediate shaft carrying the bevel gears is mounted in a heavy radial yoke with two forks at either end encircling the head shaft and the parallel countershafts. This drive secures a reduction from the motor operating at 150 revolutions per minute to four revolutions per minute of the main head shaft. All the shafts in this drive are of forged open-hearth steel with turned shoulders to receive the gears and sprockets which are mounted upon the shafts with forced fit and provided with keys and set screws, the head shafting being ten and one-half inches in diameter. Safety end-thrust collars of steel and bronze are provided to prevent the side play of the shafts. The bearings for the first two reduction shafts are mounted on heavy cast-iron pedestals with removable caps and bronze bushings, and are lubricated by means of a forced feed pump operated by an eccentric attached to one of the countershafts. The slower revolving head shaft and bevel gear shaft are provided with brass compression grease cups.

The bucket lift drive, including head sprocket motor and countershaft bearings, are mounted on a continuous cast-iron bed plate of engine type, which, in turn, rests upon solid pressed cork blocks two inches thick. The cast-iron bed plate is filled with concrete to reduce the vibrations and prevent the transmission of sound to the other parts of the Post Office Building.

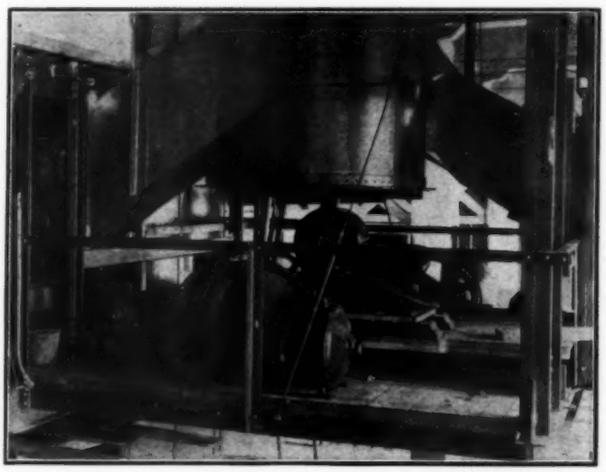
The fifty-horsepower motor is of the open, split frame, multipolar type designed for 650 volts direct current with a normal speed of 150 revolutions per minute. The motor is capable of running at the rated capacity for a period of not less than six hours, with a resultant rise in temperature of field and armature windings and bearings not exceeding forty-five degrees centigrade above the surrounding or room temperature, the commutator rise not exceeding fifty degrees centigrade. The field and armature windings have been designed to secure an increase of twenty per cent above the normal motor speed by shunt-field regulation and a decrease of twenty per cent below the normal motor speed by armature resistance. The motor is designed to deliver the rated horsepower when operating at the maximum speed of twenty per cent above normal.

The bucket-lift motor is equipped with a magnetic self-starting controller fitted with no-voltage, overload and push-button release features, and is designed to operate on 650-volt direct-current service. The controller is arranged with a solenoid-actuated switch designed with a vertical operating plunger with contact points for cutting in and cutting out resistances for the speed control of the motor. This switch is energized by a solenoid-controlled circuit-maker and circuit-breaker provided with magnetic blowout. The controller may be operated from two push-button stations, one installed at the track platform level and the other located in the machinery room of the bucket lift on the mezzanine floor of the Post Office. These operating stations consist of a bank of push buttons marked "on," "off," "run," and "safe stop." The stations are so wired that, upon pressing a button marked "run," at either station, the main-line motor solenoid switch mounted on the panel is closed, but the motor will not start until the button designated "on" is pressed. This will gradually bring the motor up to its minimum speed, and each subsequent push of the "on" button will increase the motor speed step by step, until the maximum speed is attained, there being seven speed steps available.

By pressing the "off" button the motor speed may be reduced step by step for each press of the button until the motor is stopped. The operation of the "safe stop" button at either station opens the main-line switch, and it is impossible to start the motor from either station until the "run" button at the station at which the "safe stop" button was pressed is again operated,



VIEW OF OVERHEAD BELT CONVEYOR AND OF BOTTOM OF ONE OF THE SPIRAL CHUTES.



DELIVERIES AT LOWER END OF CHUTE AND MOTOR DRIVES FOR THE TWO CORRESPONDING CONVEYOR BELTS.

thus closing the main line switch. The "safe stop" button performs the function of an interlock, so as to prevent the machinery from being started from the other station while repairs or adjustments are being made. In addition to the two operating stations mentioned, release push buttons are located at the train platform convenient to the loading stations, for shutting down the machinery in case of emergency. Immediately above each of the manual loading stations and the automatic loading stations of the bucket lift, are installed U-shaped pivoted bars extending around the front and sides of the path of the buckets, so that any mail bags protruding beyond the front edge or sides of the bucket will raise the aforementioned bars, which, in turn, will close a switch connected with the push button release circuit, thus shutting down the machinery and preventing damage to the bags or machinery.

The controller, including operating switches, main line switch, circuit breaker and resistances, is mounted upon a blue Vermont panel carried upon a substantial iron framework.

There are two sources of current supply for operating the mail-handling motors.

In the picture of the mail-handling equipment in operation, the private street at the ground level, and the common motor for the bucket elevator and underground conveyor appear at the top. Outgoing pouches are being dumped in the spiral chute leading from the Post Office in the basement to platform 13, and are being loaded in a car on track 22 standing at this platform. The other overhead conveyor, over platform 14, is also well shown. In the middle of the view is a motor truck, standing at the door of one of the plunger elevators. At the extreme right is the south spiral chute in operation, and behind same incoming mail is being received on the basement level, delivered by the bucket elevator from the belt running under platform 4. The train which brought this mail is standing on track 8 in the background, and underneath may be seen the twenty-two-foot high motor truck subway.

At the end of the year 1909 there were in use in the coal mines of Great Britain and Ireland 777 electrically driven coal-cutting machines, representing not less than 20,000 horsepower in the aggregate.

Convention of Byllesby Employees.

The second annual convention of the officers and employees of H. M. Byllesby & Company was held at the Auditorium Annex, Chicago, January 17 to 20, with an attendance of 250 delegates. Forty cities in twelve western and southern states were represented.

Following an address of welcome by President Byllesby, the convention, with F. H. Tidnam, of Oklahoma City, presiding as chairman, settled down to a four-days' consideration of a program composed of professional and technical papers.

Mr. Byllesby said in part:

"I hope I shall be pardoned if I refer to the marvelous development of public-service corporations. The men who had the courage and the faith to invest their own fortunes, great or small, and by sacrifices of every description to induce the investing of additional capital in the betterment of this business at a time when it was looked upon as experimental and chimerical and unprofitable deserve a fair hearing at the hands of the public. Because some of the pioneers and prominent workers of the public-service business, as the result of years of toil and conscientious industry, along with certain human errors and mistakes, have amassed independent fortunes, we should not close our eyes to the fact that the great numerical majority died heartbroken and in penury.

"It would appear that the world has advanced to a point where controversies should be handled in an advanced and enlightened spirit—where heartburnings and unfair advantages or arguments on one side or the other of the case should be avoided.

"On the broad question of public-service commissions I believe, speaking for all of my associates, there is no objection to the public-service commission *per se*, but a very earnest plea is made that the public-service commission should be composed of men of integrity and of ability, and men who have had a previous experience in the business in regard to which they are proposing, under color of a law, to pass regulations and rules.

"I believe a large part of the present unrest and antagonism between corporations and the commissions and lawmakers would disappear if the corporations appeared before bodies composed of men of breadth of vision, free from favoritism and who had a working knowledge of the problems confronting the enterprises upon which they are passing."

Vice-president Arthur S. Huey, discussing the subject of "Franchises," said:

"To many the possession of a public-utility franchise is only an opportunity for personal gain; to the conscientious man such possession means an opportunity of ministering to the public welfare. A city in granting a franchise not only places in the hands of the grantee an asset of value, but makes the grantee a trustee of the public good. The term itself, public utilities, implies being useful and therefore of benefit to the public. To attain this end that service must be competent. Along with this grant go certain legal restrictions and rights.

"Speaking for H. M. Byllesby & Company, I say to you that our organization prefers to consider the spirit rather than the letter of the law, believing that if we administer our affairs as a public trust, we will seldom or never require defense of any legal rights.

"We, as managers and operators of electric, gas, street-railway and telephone properties, prefer to retain our franchises by retaining the confidence of the people; to hold the privileges conferred by the public, not by right of law, but by right of merit.

"So thoroughly does our organization believe in this principle, and so anxious are we for its genuine application in all the municipalities in which we operate utilities, that I am now making a special effort to deeply impress upon you its far-reaching significance.

"In few other lines of endeavor do petty practices cost so dearly as they do in the operation of public utilities. It is suicidal to adopt a policy bounded by the straight-laced terms of contract and franchise."

One of the matters of general interest considered was the establishment of an employees' magazine. On Tuesday evening the delegates visited the Chicago Electrical Show. The social features included a theater party Thursday evening and a banquet Friday night, to conclude the meeting.

The program of papers was as follows: "Insurance," by W. E. Higbee, of Chicago; "Advisability of Utility Companies Handling Gas and Electrical Appliances," by Samuel Kahn, of Fargo, N. D.; "Ornamental Curb Light-

ing," by B. W. Cowperthwait, of Faribault, Minn.; "Effective Illumination," by A. Darney, of Oklahoma City, Okla.; "Accounting Statistics," by N. P. Zech, of Chicago; "Central-Station Economies," by Eugene Holcomb, of St. Paul, Minn.; "Unusual Engineering Design and Construction," by W. R. Thompson, of Chicago; "The Prepayment Gas Meter," by Henry H. Hyde, of Tacoma, Wash.; "Construction of Hydroelectric Plants Relative to Economy in Operation," by J. M. Link, of Chicago; "Electric versus Horse-Drawn Wagons," by F. H. Tidnam, of Oklahoma City; "The Effect of Low-Wattage Lamps on the Central-Station Industry," by Alex F. Douglas, of Portland, Ore.; "Progress and Success of the Employees' Investment Club," by R. J. Graf, of Chicago; "Late Development in the Manufacture of Crude-Oil Gas," by R. F. Clark, of San Diego, Cal.; "New Business," by E. L. Callahan, of Chicago; "District System of Meter Reading," by T. K. Jackson, of Mobile, Ala.

COMMONWEALTH AVENUE.

Chicago Electrical Show.

The closing week of the Chicago Electrical Show, which was held in the Coliseum under the direction of the Electrical Trades Exposition Company, from January 7 to January 21, carried out the promises of the first week. There was apparent all during the exposition an increasing attendance upon the part of the public and upon the part of manufacturers and large users of electrical and kindred apparatus. The complete returns for attendance have not been compiled, but the large numbers attracted during the two weeks have made a substantial and gratifying total.

The decorative features and the description of apparatus exhibited, together with lists of those in attendance as representatives of the exhibitors were published comprehensively in last week's issue.

During the first week there was a meeting of the Electric Club of Chicago, on Wednesday, at noon, when an address was made by H. H. Cudmore, president of the Electrical League of Cleveland and president of the Brilliant Electric Company, of Cleveland, explaining the features of the sister organization and endorsing the policy of the electrical interests of Cleveland in establishing a "co-operative electrical page" to appear regularly in one of the more important Cleveland newspapers. On Friday night of the first week the Illuminating Engineering Society held a meeting and supper when a paper by H. E. Ives entitled "Luminous Efficiency" was abstracted by A. L. Eustice, followed by considerable discussion.

Headquarters of the Sons of Jove were established during the second week of the show, and a great many of those in attendance at the exposition repaired on Tuesday evening to the Auditorium Hotel where a successful and enjoyable rejuvenation and joviation were held. On Tuesday evening the employees attending the H. M. Byllesby convention attended in a body and on Friday there was a large at-

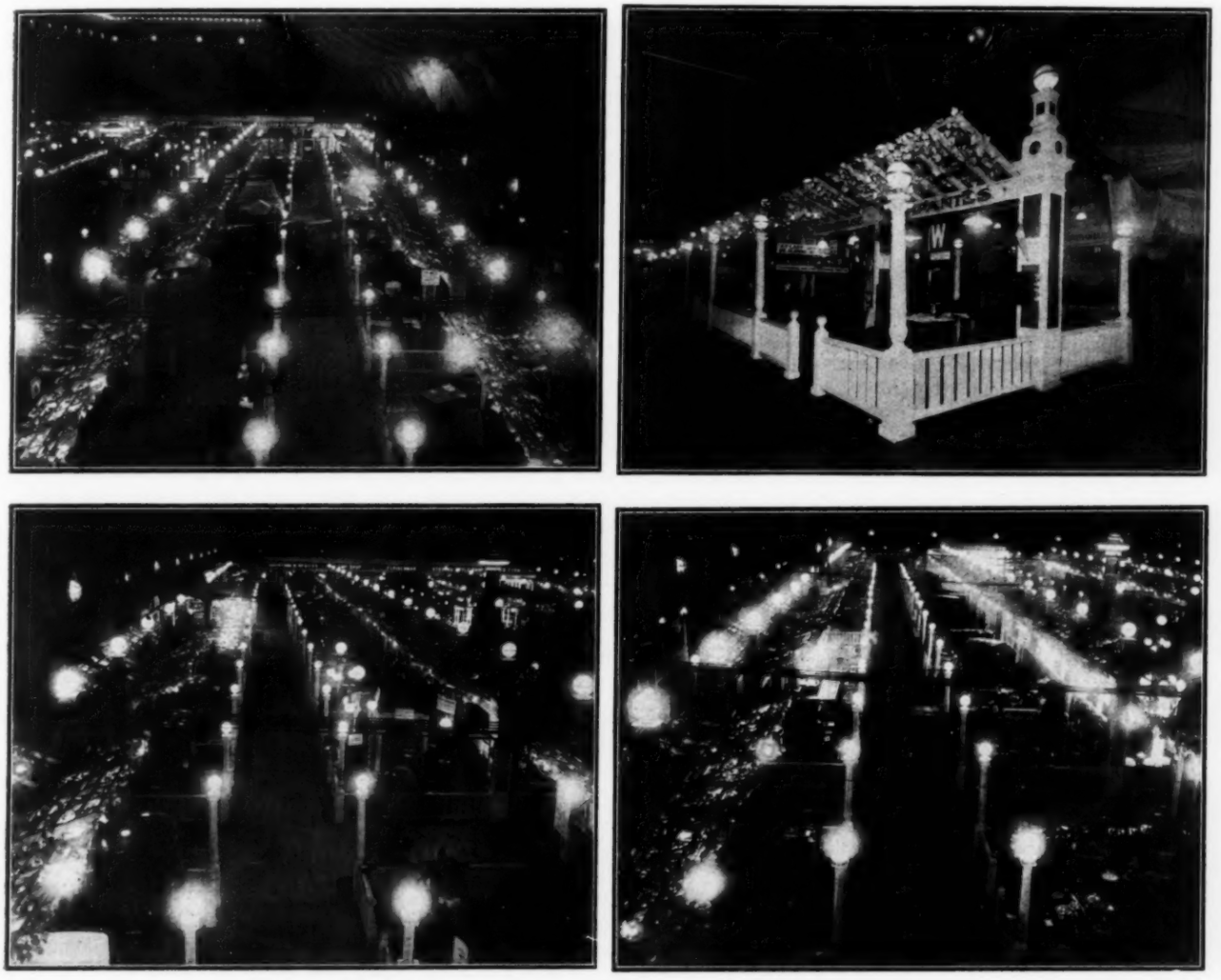
tendance of those who had been attending the meeting of the Wisconsin Electrical Association at Milwaukee. Full reports of these other functions are published elsewhere in this issue.

Water-Power Utilization in Japan.

The granting of water rights by provincial authorities of Japan has been suspended, according to the report of an American consular officer in Yokohoma, it being asserted that of the 1,350,000 horsepower concessions already granted many have been secured by parties who intend to speculate in hydroelectric franchises, which is branded as an evil, and the government is now making a systematic examination and survey of the water-power sources in the Empire. There are to be thirteen offices established for the collection of this information, and when this is assembled suitable regulations will be promulgated. It is very necessary to have careful investigations made, as a great many streams in Japan are dry in summer.

There are a number of hydroelectric power plants already constructed in Japan which are of comparatively small capacity.

The only large operating plant is the Katsuragawa power plant located about forty miles from Tokyo, which develops about 20,000 horsepower for use in that city. Another large plant is being developed in the vicinity of Kyoto, and still another very large one is under consideration about forty or fifty miles from Tokyo, which will be entirely separate from the Tokyo electric light plant.



GENERAL VIEWS OF THE CHICAGO ELECTRICAL SHOW.

Canadian Electrical Commercial Committee.

President Coate of the Canadian Electrical Association has appointed the Commercial Committee, which was suggested at the Muskoka convention. The men appointed to serve are:

Eugene Creed, Toronto Electric Light Company, Limited, chairman; C. J. McNabb, Montreal Light, Heat & Power Company; J. H. Larmouth, Belleville Electric Power Company; W. H. McIntyre, Ottawa Electric Company.

J. G. White and Denver Irrigation.

In the biographical sketch of James G. White, which appeared in our issue of January 7, it was erroneously stated that Mr. White's company was engaged in the construction of a dam and irrigation system for the Denver Reservoir & Irrigation Company. We are informed by J. G. White & Company that all connection with this project was severed before the actual construction work was begun, and the company is not identified in any way with the plans of the present work.

CORONA DISCUSSED BY AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

JANUARY MEETING IN NEW YORK.

The two hundred and fifty-fifth meeting of the American Institute of Electrical Engineers was held at the headquarters in New York City on the evening of January 13 with President Dugald C. Jackson in the chair. Secretary R. W. Pope announced the election of 111 Associates and the transfer of one Associate to the grade of Member. N. J. Neal announced the joint meeting of the American Society of Mechanical Engineers, the Boston Society of Civil Engineers, and the Boston Section of the American Institute of Electrical Engineers that is to be held in Boston on the evening of January 31 and at which Prof. Elihu Thomson will be guest of honor.

Prof. Harris J. Ryan was then introduced. He presented a brief abstract of his paper, "Open Atmosphere and Dry Transformer Oil as High-voltage Insulators," which formed the subject of the evening's discussion.

AIR AND OIL AS INSULATORS.

Professor Ryan's paper covers seventy-six pages of the Institute *Proceedings*, this fact alone indicating its exhaustive character. He first takes up the reason for the dielectric strength of air in the neighborhood of small conductors being less than near large ones and shows that the appearance of corona is dependent not only on a minimum stress but also on a minimum striking distance. He derives a curve of critical corona striking distances for different diameters of wire. Dwelling on the researches of Prof. F. E. Nipher, he points out that other factors besides electric stress affect corona formation. He also considers the work of J. S. Townsend and others and concludes that ionization by collision is the basic feature in all these phenomena. A long section of the paper then takes up the electronic theory in its relation to corona formation. He shows the relation of barometric pressure, dirt on the conductors, form of the electrodes, power transmission current, etc., as influencing the critical voltage. A large number of test results are given as bearing out the author's deductions. The best possible summary of the paper is given in Professor Ryan's own statement of his conclusions regarding the open atmosphere as an insulator; these are:

1. Ionization and the travel of ions under electric stresses are the causes of failure of the open atmosphere as an insulator and they are the cause of corona formation.
2. All ordinary failures of the atmosphere under stress are developed through ionization by collision, which can be started under usual high-voltage electric stresses through the presence of some natural or antecedent supply of ions.
3. Variation in the supply of natural ions in open air is the cause of the erratic variation of critical loss-voltages. Such variations have little effect upon the values of the part-corona voltage that has increased the atmosphere loss by the small amount equal to the loss caused by the inevitable ion-convection current.
4. The figure of the electric field about the high-voltage conductors determines the facility with which the migrating ions will concentrate the electric stress near the surface of the conductor and thus render the resulting corona irregular at all stages, causing it to be started and to be maintained at correspondingly lower voltages.
5. The turbulent elements introduced by variations in the amount of natural ionization have so small an effect upon the corona-forming pressures, and the field irregularity factor above referred to is so nearly constant over a wide range of conditions, that the rational formula as developed should be found dependable to a reasonable extent.
6. The term "dielectric strength" as applied to the open atmosphere, from the inherent nature of things, can have no definite meaning.
7. The rupturing strength of the normal atmosphere rests upon two factors only, (1) quantity of ionization produced by the rupturing voltage, (2) the distance between the electrodes. The rupturing gradient varies from 300 kilovolts per inch at lowest ionization to 3 kilovolts per inch at highest ionization with no indication that the limits at either end of this range have as yet been found.

Professor Ryan's conclusions in regard to dry transformer oil as an insulator are:

1. The failure of the oil as an insulator is due to ions liberated by the electric stress from the supply of free ions in the metals of the electrodes.
2. The electric stress required to detach ions from metals to the oil is much lower than the corresponding stress for a gas.
3. The further conclusion follows necessarily that a compressed gas must, in regard to insulating quality alone, be superior to oil.

Dr. M. I. Pupin opened the discussion with a statement that he had done no experimental work in this field for sixteen years and therefore felt incompetent to discuss the subject. He was pleased, however, to note that Prof. Ryan had written this voluminous paper, which was really a treatise, in terms of the electronic theory. This he felt was essential to any adequate consideration of high-potential phenomena. About twenty-two years ago it had been shown that perfect gases, like oxygen or hydrogen, cannot be electrified and therefore are perfect insulators, even at tensions of several million volts. Likewise, a perfect vacuum is a perfect insulator. Therefore, a discharge through either of these mediums must be due to the presence of some foreign particles. Professor Ryan had shown it must be through free electrons or free ions, whether they be dirt or other foreign substances. The smallest particles, the electrons, produce ionization by collision because they attain the highest velocity under the same accelerating force. When the space is sufficiently filled with electrons a discharge can take place between the electrodes and corona and similar phenomena result. Dr. Pupin emphasized the importance of considering the exact character of the potential gradient. Only when the plates are very close together are the results as anticipated. The speaker then explained why the tendency of the discharge through the gas is to form a core.

Percy H. Thomas, chairman of the High-tension Transmission Committee, then announced that the Overhead Line Construction Committee of the National Electric Light Association had prepared jointly with similar committees from other engineering societies a set of specifications for high-tention crossings which it wishes to submit to the Institute members for criticism and ultimate approval with the hope of securing a standardized practice in regard to such crossings with railroads, telegraph, telephone and other lines. Farley Osgood also sought co-operation from the Institute in regard to this matter.

The discussion was resumed by Professor Ryan reading a communication from E. L. West, general manager of the Central Colorado Power Company, in which the results of a series of tests on the 100,000-volt sixty-cycle, 180-mile transmission line of that company were given. These results showed the interesting fact that with no load at the receiving end the line losses were greater than when transformers were connected in. This was explained by the load in the latter case lowering the voltage at the receiving end below the critical value for corona formation.

Ralph D. Mershon admitted he was willing to accept the electron theory of the corona phenomena if some seeming discrepancies could be satisfactorily explained. He thought the equation should include a term that would take account of the thickness of the film.

Prof. G. Faccioli explained some experiments conducted by him and Mr. Moody some two years ago. When a piece of insulating tape was wrapped about the wire, corona would form at a lower voltage than when the wire was bare. This is not true under oil, however. He differed with Mr. Ryan on the classification of corona, also as to the critical voltage in the Colorado tests.

Dr. C. P. Steinmetz regarded the paper as another classic from the pen of Professor Ryan, but not because of its explanations of the phenomena by means of the electronic theory, rather in spite of it. He was not yet con-

vinced that engineers could fully accept the electronic theory. Professor Ryan had conclusively shown that not only a certain voltage gradient but sufficent voltage within a certain distance of the conductor is required to start corona. He also explained the coring effect of the current. His third important point is the statement that air does not have a definite breakdown strength, but that this varies with its conductivity. He also shows the conduction of the Geissler tube is not so radically different from that of the disruptive spark, the difference being due to gas pressure only. Arc conduction is a different matter, however.

Wm. Stanley spoke briefly of the possibility of co-ordinating the conflicting views of the electronic theory through the results of further researches on its mysteries within the next few years.

The president then read the names of James B. Whitehead, Samuel Sheldon, Erich Hansman, W. S. Moody, John B. Taylor, J. B. Noeggerath, H. M. Fisher, Arthur Williams, H. C. Ford, H. B. Smith, H. W. Buck, A. B. Hendricks and F. L. Peck, who had promised to communicate written discussions on the paper. Four of these gentlemen had, in fact, already done so.

Professor Ryan then briefly closed the verbal discussion by explaining why he had been compelled to use such odd expressions as magneto-mechanic to convey an appropriate picture of the phenomena.

Changes in the Electrical Rules, New York City.

It is proposed to effect on April 1, 1911, the following changes in Rules 40 and 41, relating to rubber-covered wires. Meanwhile constructive criticism is invited thereon by the Bureau of Electrical Inspection, Department of Water Supply, Gas and Electricity, New York City.

40a. Add at the end of the second paragraph, and immediately preceding the table, the following: "which applies to tinned conductors."

41. Insert the following fine print note immediately after the title, Rubber Covered Wire: "All tests required by this rule shall apply on all wire at the time of manufacture as well as up to and including the time of installation."

41b. Substitute for the sentence preceding the table, the following: "Must consist of rubber or other approved compounds, homogeneous in character, adhering to the conductor, and of a thickness not less than that given in the following table."

41c. Substitute for the present rule, the following: "Every length of completed wire or cable must be tested after ten hours' immersion in water, temperature to approximate sixty degrees Fahrenheit (15.5 centigrade) and results of insulation tests at different temperatures to be reduced to a basis of sixty degrees Fahrenheit by using factors in the following table. These tests must be made after an electrification of one minute and with a voltage of not less than 100 volts.

TABLE OF MULTIPLIERS TO CORRECT INSULATION RESISTANCES AT OBSERVED TEMPERATURES TO MEGOHMS AT SIXTY DEGREES FAHRENHEIT.

Temperature Degrees Fahrenheit.	Multiplier.	Temperature Degrees Fahrenheit.	Multiplier.
85	2.68	67	1.32
84	2.58	66	1.27
83	2.48	65	1.22
82	2.38	64	1.17
81	2.29	63	1.12
80	2.20	62	1.08
79	2.12	61	1.04
78	2.04	60	1.00
77	1.96	59	0.96
76	1.88	58	0.92
75	1.81	57	0.88
74	1.74	56	0.85
73	1.67	55	0.82
72	1.60	54	0.78
71	1.54	53	0.75
70	1.48	52	0.72
69	1.43	51	0.69
68	1.37	50	0.66

"Voltage tests and minimum insulation resistance to be in accordance with the following table:

TESTS ON COMPLETED LENGTHS RUBBER-COVERED WIRES AND CABLES, 0 TO 600-VOLT CLASS.

Size.	Voltage tests for one minute.	Megohms per mile after 10 hours' immersion and after voltage test.
14	1500	300
12	1500	250
10	1500	225
8	1500	200
6	2000	200
4	2000	150
2	2000	125
1	2500	150
1/0	2500	125
2/0	2500	125
3/0	2500	100
4/0	2500	100
250,000 C. M.	3000	100
300,000 C. M.	3000	100
400,000 C. M.	3000	100
500,000 C. M.	3000	100
600,000 C. M.	3500	100
700,000 C. M.	3500	100
800,000 C. M.	3500	100
900,000 C. M.	3500	100
1,000,000 C. M.	3500	100
1,250,000 C. M.	3500	100
1,500,000 C. M.	3500	75
1,750,000 C. M.	3500	60
2,000,000 C. M.	3500	50

"Any length may be tested after 30 days' immersion in clear water and must show not less than 50 per cent of insulation resistance required after 10 hours' immersion.

41d. Change to read as follows: "Any one foot length, etc.," instead of "Each foot."

In the fourth line of the second paragraph, change "4,000" to "3,000."

41h. Substitute for the present rule, the following:

"Test for Hardness of Insulation. The rubber or other approved compounds used as an insulation, must, after the braid has been carefully removed, be sufficiently elastic to permit all wires smaller than No. 7 B. & S. gage to be wrapped at least five times around a cylinder of diameter as specified and left so wrapped for twenty-four hours without injury to the insulation. The diameter of cylinder used for any size wire shall be as follows:

No. 8, equal to twice the diameter.

No. 9, of wire measured over the insulation.

No. 10, after removing the braid.

No. 11, equal to the diameter of wire.

Smaller, measured over the insulation, after removing the braid.

"Test for Softness of Insulation. The rubber or other approved compounds used as an insulation must present sufficient resistance to crushing or tension to withstand the following two tests: Samples while being prepared for these tests shall have a temperature between 50 and 90 degrees Fahrenheit and shall be kept within these limits during the tests.

"Test A. A sample of wire of sufficient length for test, about twenty inches, shall have the braid and insulation removed for about two inches at each end, leaving the braid and insulation in balance of sample. One end of the bare copper shall be fastened to a clamp on a shaft of the diameter given below, and a ten-pound weight attached to the other bare copper end of the wire. The shaft shall then be revolved ten times in ten seconds, wrapping the sample in a close, even wind around the shaft. With the tension left on the sample, it shall then be immersed in water at a temperature of 60 degrees Fahrenheit for twenty-four hours, immediately after which time it shall, while still immersed, be subjected to 1,500 volts alternating current for one minute and shall show an insulation resistance equal to at least half that required by 41c.

Diameter of Shaft, No. 14 Wire, 170 mils.
Diameter of Shaft, No. 12 Wire, 190 mils.
Diameter of Shaft, No. 10 Wire, 275 mils.
Diameter of Shaft, No. 8 Wire, 375 mils.

"Test B. Sample to be tested shall have braid carefully removed for at least one inch from one end. The wire itself shall be connected to one terminal of an electric circuit, of which a testing tool, described in the following paragraph, shall be the other terminal. This circuit shall have a potential of at least 100 volts alternating or 140 volts direct current and a resistance of at least 1,000 ohms. The portion of the wire with braid removed, shall be placed on a flat surface and subjected to a pressure, vertically applied by means of the edged tool mentioned above, of five pounds for fifteen minutes. The tool edge shall be sharp and the sides of the edge shall form an angle of ninety degrees with each other. During this period the tool edge when placed transversely to the insulation shall not sink through sufficiently to touch the copper wire and complete the electric circuit."

Memorial to John Chamberlain Fish.

One of the most beautiful memorials that has ever been produced has been prepared for private circulation in loving memory and grateful appreciation of John Chamberlain Fish, late president of the National Electric Lamp Association, whose death occurred on April 16, 1909. This memorial is subscribed to by J. R. Crouse, F. S. Terry, B. G. Tremaine, H. A. Tremaine and J. Robert Crouse. There is a fine photogravure of Mr. Fish, with a facsimile of his signature and his favored expression, "I would rather make men than money." Then in regular order are several tributes—to the man, to the prophet, the authority, the philosopher, the loyal executive and the humanitarian. Besides this is a description of the memorial service and a poem written by E. H. Haughton which was read at the memorial service.

New Wireless Stations in Italy.

Military wireless stations are being erected at four points in Italy, using the Jacoviello high-voltage system.

THE ELECTRICAL LEAGUE OF CLEVELAND.

PRESIDENT ADDRESSES THE CHICAGO ELECTRIC CLUB.

The Electrical League of Cleveland, its origin, its object and its success were points interestingly brought out in a brief address delivered before the Chicago Electric Club at the regular weekly meeting of that organization on Wednesday, January 11, by H. H. Cudmore, president of the Brilliant Electric Company, Cleveland, O., and also president of the Electrical League of Cleveland.

In furtherance of a custom established some years ago, the Chicago Electric Club, through the courtesy of Manager Homer E. Niesz and the Electrical Trades Exposition Company, held its meeting in the restaurant of the Coliseum Building, where the Electrical Show was in progress. In point of attendance and sociability this meeting will be numbered among the most successful so far held.

Following a characteristic introduction by President Frederic P Vose, Mr. Cudmore spoke of the origin of the Electrical League of Cleveland. He said that at a Jovian dinner held some time ago the idea of forming a club of Cleveland electrical men originated. This culminated in the formation of the present organization, which in many respects is similar to the Chicago Club.

Meetings are held monthly at which some prominent speaker is asked to address the club on a subject of interest to electrical men. These meetings are always well attended and the very best of good fellowship always prevails. Mr. Cudmore stated that an attempt will be made to hold weekly meetings in the future.

An important phase of the work of the Electrical League of Cleveland, and one which Mr. Cudmore urged as particularly adaptable for Chicago, is the co-operative advertising page published each week in one of the Cleveland daily papers. Through the efforts of the League this paper prints a special page in its regular Saturday edition entitled the "People's Electrical Page," which contains reading matter devoted to the applications and uses of electricity and on which there is always a representative showing of advertisements. The results of advertising in this manner have been very successful. The co-operative page greatly increases the effectiveness of the advertising, which, if scattered through several pages, would lose much of its value. At the conclusion of this address Mr. Cudmore was prevailed upon to recite a poem of his own composition.

Brief remarks were made by George H. Porter, Thomas C. Ringgold and J. S. Badger. Mr. Badger, who is general manager and chief engineer of the Brisbane Tramways (Australia), commented on the development in the electrical industry in the United States during the past fifteen years.

H. H. CUDMORE,
President of the Electrical League of Cleveland.

The report of the treasurer read by President Vose shows a balance on hand of $3,222.35.

Coal-Briquette Industry of the United Kingdom.

Consul Albert Halstead, of Birmingham, states that the manufacture of coal briquettes has become a large industry in the United Kingdom. Official figures show that in 1909 the production for the whole Kingdom was 1,512,645 long tons, valued at $4,761,860. This output was divided: England, 177,895 tons, valued at $568,071; Wales, 1,270,235 tons, valued at $3,948,591; Scotland, 43,620 tons, valued at $144,885; and Ireland, 20,895 tons, valued at $100,313. The values given represent the selling price at place of manufacture.

Annual Convention of the Northwestern Cedarmen's Association.

The fifteenth annual convention of the Northwestern Cedarmen's Association was held in Minneapolis, Minn., January 10 and 11, at the Radisson Hotel. The meeting was presided over by President T. M. Partridge. In his presidential address, delivered at the opening session, Mr. Partridge spoke of the value of the Association to each individual member. He spoke of forest fires and urged that member companies take immediate action in regard to contemplated bills before the state legislatures in the lake states. The question of workingmen's compensation and business conditions and stock were also treated.

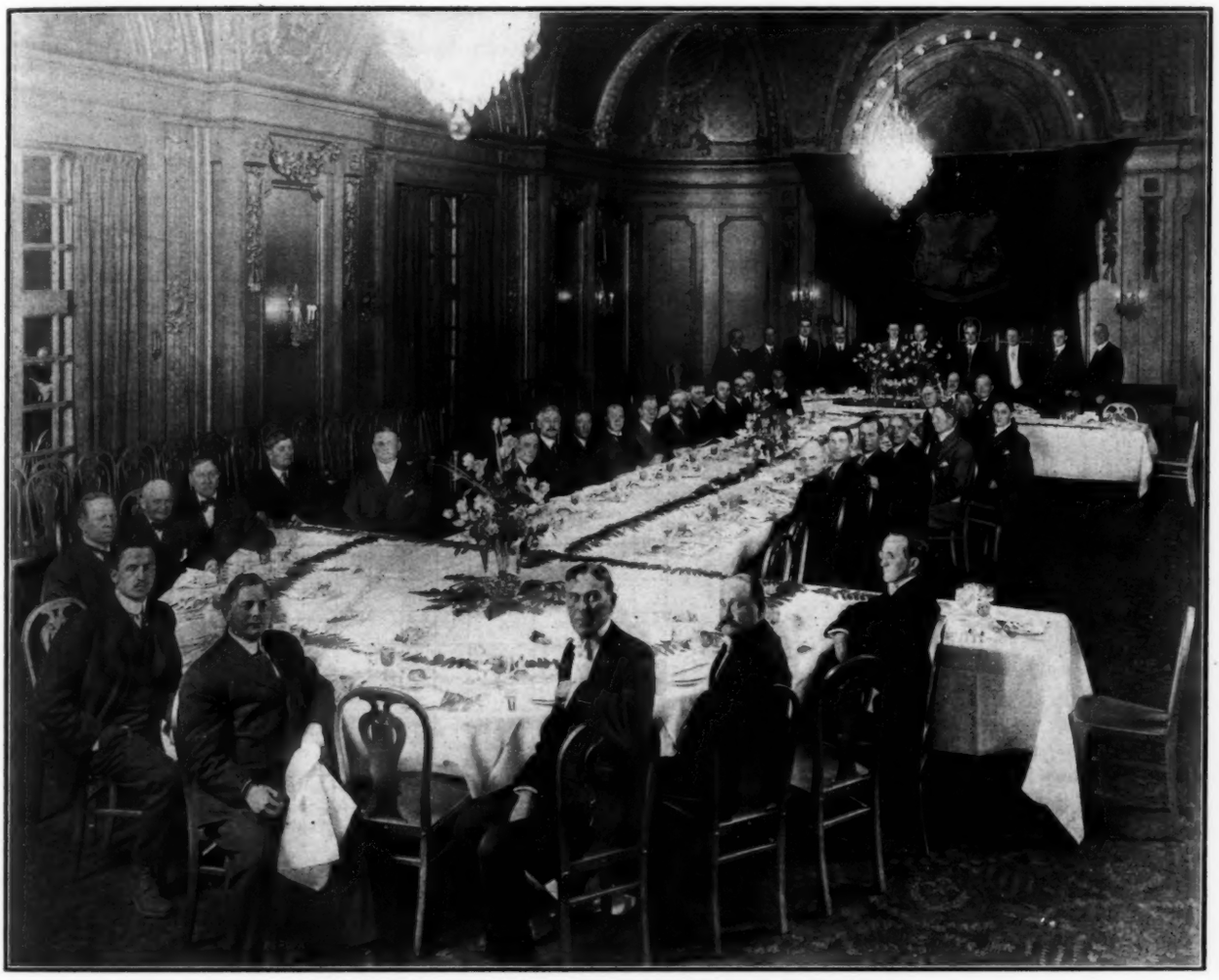
Secretary H. H. McKinney followed with his report, in which he reviewed white cedar conditions during 1910. He said that at the beginning of the year indications were excellent for a good year's business at reasonable prices, but that these expectations failed somewhat of realization. Mr. McKinney then reviewed the present specification of poles, making numerable suggestions, and also covered the points of trouble with railroads regarding shipping rates, market and stocks and membership in the association.

At the afternoon session a very important and interesting address on the subject of insurance was delivered by R. M. Ritchie.

Mr. Ritchie prefaced his remarks by saying that the last two years had been strenuous ones for fire insurance companies. The losses on timber products for 1910 had been very large, due to the extremely dry weather. He dwelt at length on the 200-foot space between piles and forest exposure. He said the basis of a minimum rate is fixed according to fire protection, that the lumber companies were penalized for inefficiency. As an example, 1,000 feet from heavy forests is fixed by the insurance companies as a reasonably safe distance that material should be piled. The closer the posts and poles are piled to the forests the higher the rate will be. He said that when peeling is done in the yard there is the hazard of peelings lying around, which aids considerably in spreading fire. The steam boiler with the stack throwing out a spark, he said, surely is a hazard over the yard without one. There are a number of other penalties of like character, all based on known hazards.

Mr. Ritchie told the lumbermen that it is practically up to them to make their own rate, that the insurance companies stand ready at all times to recognize conditions which better their yards, by making concessions in their rates.

This paper engendered a long discussion by the members present and finally ended in the appointment of a special committee to prepare a resolution looking into the Minnesota fire insurance cancelation clause.



BANQUET OF THE NORTHWESTERN CEDARMEN'S ASSOCIATION.

At the Wednesday morning session the resolution prepared by the committee was presented. It urged that each member take up the question of amending the insurance laws with his representative and that the Association as a body confer with the legislative committees on this subject.

The next order of business was the election of officers, which resulted as follows: President, T. M. Partridge, of Minneapolis (re-elected); vice-president, E. C. Norton, Escanaba, Mich.; and secretary, H. H. McKinney.

On Wednesday evening the annual banquet was held in the banquet hall of the Hotel Radisson. A very enjoyable meeing was held at which toasts and songs prevailed.

Petroleum Produced in the United States in 1910.

The year 1910 has been sufficiently eventful in the development of new oil supplies in the United States to more than keep up the country's phenomenal production of the last three years.

In fact, the year's production increased to over 200,000,000 barrels, which is two-thirds of the world's production and several million barrels more than the whole world produced seven years ago. The prospects are for still further increases.

The most surprising developments of the year were the Sunset-Midway district of California. The developments in the Caddo field of Louisiana also entirely changed the position of that field. Connected with the developments in both these fields were important changes in the conditions of marketing the oil.

The production of oil in the United States in 1910, as reported by D. T. Day, of the United States Geological Survey, was between 200,000,000 and 208,000,000 barrels, approximately, as follows:

	Barrels.
Illinois	32,000,000
Appalachian and Lima-Indiana fields.	32,000,000
Gulf and Caddo fields	14,000,000
Mid-Continent and Rocky Mountain fields	53,000,000
California	73,000,000
	204,000,000

Stocks increased over fifty per cent on the Pacific coast. Prices of crude oil declined except in the Mid-Continent field, where they increased forty-four cents a barrel.

STANDARDS OF CAPACITY.[1]

BY H. L. CURTIS.

There are two conditions which should be fulfilled by a condenser which is to be used as a standard of capacity. In the first place its capacity should remain constant so long as the temperature, atmospheric pressure, and other external conditions remain constant, and it should return to this capacity whenever these external conditions are reproduced. In the second place the capacity should be the same when measured with different voltages, with different frequencies, or with different times of charge or discharge. There is at present no class of condensers which entirely fulfils these conditions, the nearest approach being in the case of air condensers and of mica condensers.

The capacity of air condensers is entirely independent of the method of measurement, but on account of the large pieces of insulating material usually used in their construction, the capacity follows changes of temperature so slowly that the condition of constancy is not fulfilled in practice. Moreover, except for the smallest capacities, an air condenser is so bulky as to be impracticable. Therefore in the majority of cases mica condensers are used as standards, and an investigation of their behavior becomes important. To determine the effect of temperature and applied voltage upon the capacity of mica condensers, as well as to determine the influence of the method of measurement upon the measured capacity, the author has investigated a number of mica condensers, and from the results of these measurements has drawn some conclusions as to what may ordinarily be expected of condensers of this type.

A mica condenser differs from an air condenser in that it shows absorption. If the capacity of a mica condenser could be measured with alternating current of infinite frequency, no absorption would take place, and the value of the capacity so determined would depend only on the dimensions and dielectric constant of the dielectric. This capacity we shall call the geometric capacity. The same result should be obtained with direct-current measurements, provided the length of charge or of discharge is of infinitely short duration. Neither of the above measurements is possible. but with alternating currents it is possible to make measurements at several different frequencies, and extrapolate to infinite frequency. Also with direct current, measurements of the capacity can be made at several definite and very short times of discharge, and by extrapolation a value can be obtained for an infinitely short discharge. A number of such determinations were made with different condensers and in all cases the value of the geometric capacity as determined by the two methods agreed to within the errors of the method, which is a few parts in a hundred thousand of the value of the capacity. An illustration of each of these methods for determining the geometric capacity is given in Fig. 2.

It would seem possible to start from this value of the capacity, and express all of the direct-current values and of the alternating-current values by means of some function which would be derived from the absorption. Up to the present time this has not been done. Hence it is necessary to determine the capacity by the method to be used in making measurements with it. For example, if a condenser is to be used for the determination of the constant of a ballistic galvanometer, its capacity must be measured by direct current, using the same length of time for charge and discharge as is used in determining the constant of the galvanometer. On the other hand, if a condenser is to be used in alternating-current measurements, its capacity must be determined by alternating current of the same frequency as is used in making the measurements. In either case it is, of course, possible, after making several measurements, to draw a curve from which intermediate values can be interpolated. The alternating-current values of the capacity at ordinary frequencies are never more than 0.2 or 0.3 per cent larger than the geometric capacity; but the direct-current values, using relatively long times of charge and discharge, may be several per cent larger.

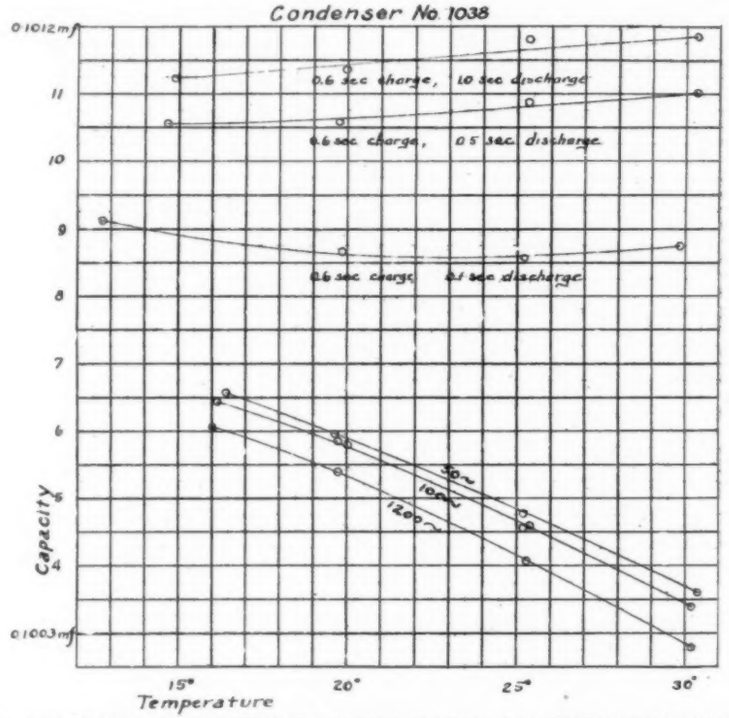


FIG. 1.—CHANGE OF CAPACITY WITH TEMPERATURE AND WITH FREQUENCY.

The effect of temperature upon the capacity is also rather complicated. The geometric capacity usually has a negative temperature coefficient; that is, the capacity decreases as the temperature increases. The values run from zero to —0.06 per cent per degree, the average being about —0.01 per cent per degree. However, the absorption of a condenser always in-

1 Abstract of a paper to appear in the *Bulletin of the Bureau of Standards.*

creases rapidly with the temperature, so that the temperature coefficient of the measured capacity is algebraically larger than that of the geometric capacity. Hence the longer the time of charge and discharge, or the lower the frequency, the more will the temperature coefficient of the measured capacity vary from that of the geometric capacity. It follows that the temperature coefficient of the capacity of a single condenser may be positive, zero, or negative, depending on the method of measurement.

The change of capacity with the method of measurement, as well as the change of capacity with temperature, is illustrated in Fig. 1. The curves are those of a good mica condenser and are typical of what may be expected of a condenser of this type. It will be noticed that the capacity, when measured with high-frequency alternating current, decreases as the temperature increases, but that the decrease is less when lower frequencies are used. With the relatively long times of charge and discharge which are here shown the capacity increases with the temperature.

A priori, there seems to be no reason to expect that the capacity will change with the voltage and ordinarily it does not. However, an occasional condenser of the ordinary type and every silvered-mica condenser which has come to our notice does show such a change, the variation of the capacity amounting in some cases to 0.1 per cent for a change of 50 volts. The cause for this is believed to lie in the flaky nature of the mica, which permits conducting materials to penetrate underneath the surface.

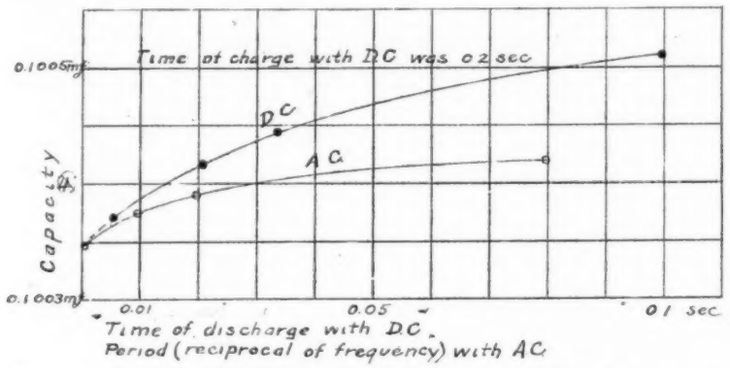


FIG. 2.—DETERMINATION OF THE GEOMETRIC CAPACITY.

In order that a condenser may have a constant capacity, it is necessary that there shall be no change in the relative positions of the parts of the condenser. It is well known that if a mica condenser is heated to such a temperature that the paraffin which permeates the condenser begins to melt, there is very sure to be a permanent change in the capacity, which may in extreme cases amount to several per cent. As the common grades of paraffin begin to melt at about thirty-five degrees Centigrade, a safe rule to follow is to keep a condenser at all times below thirty degrees Centigrade. Besides this change, it is found that if a condenser is kept at room temperature, and the temperature of the condenser determined by a thermometer in its case when the capacity is measured, there may be a discrepancy of 0.02 or 0.03 per cent between the measured capacity and the capacity as computed by means of its known temperature coefficient and its value at a standard temperature. This arises, at least in part, from the uncertainty in the temperature measurement, since the thermometer is always outside the condenser proper. However, it seems probable that in addition there are slow secular variations caused by the continual changes in temperature. If kept at as near a constant temperature as possible, these variations are considerably reduced, and if in addition the condenser is kept in a vacuum, the variations are reduced to a few parts in a hundred thousand. The variations of capacity observed with typical condensers over a period of nearly five months are shown in Fig. 3.

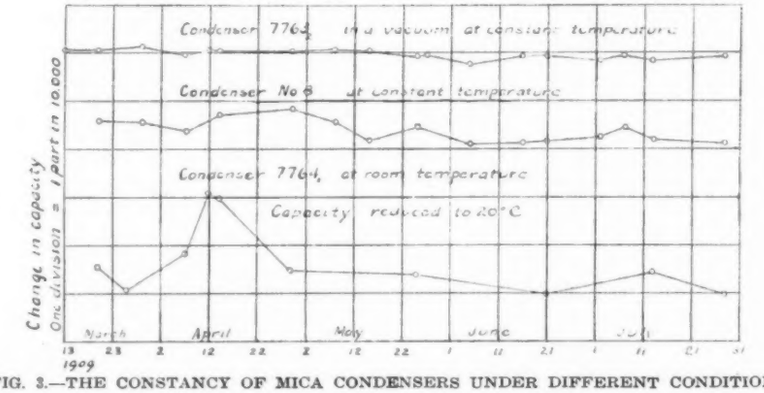


FIG. 3.—THE CONSTANCY OF MICA CONDENSERS UNDER DIFFERENT CONDITIONS.

The reliability of a mica condenser as a standard depends, therefore, largely on the care with which it is treated and measured. A single measurement of the capacity is not sufficient if the condenser is to be used for a variety of purposes. If properly studied, however, a mica condenser may be used in precise electrical measurements.

Electrical Requirements in Toledo.

An ordinance intended to secure the best possible in electrical wiring has been approved and will be adopted by the Toledo City Council. It provides that those who do electrical work must pass a written examination before the electrical inspector. This enables them to secure a certificate of registration, good for the period of one year. Electrical wiremen who have had three years' practical experience need not take the examination. No work is to be done without first securing a permit at the office of the city electrical inspector.

Spring Meeting of Electrochemical Society.

The dates for the nineteenth general meeting of the American Electrochemical Society, already announced to take place at the Chemists' Club, New York City, have been fixed for April 6, 7 and 8.

WESTERN SOCIETY OF ENGINEERS.

FORTY-FIRST ANNUAL MEETING.

The Western Society of Engineers held its forty-first annual meeting and dinner on the evening of January 11, at the Hotel La Salle, Chicago.

Retiring-president John W. Alvord announced the following awards of the Octave Chanute medals for the best papers presented before the society in the preceding year: A. Bement, for his paper on the "Illinois Coal Fields;" R. H. Rice, for his paper on "Low-Tension Feeder Systems for Street Railways;" to the estate of the late founder of the fund for his pioneer work in the interest of aviation.

Secretary J. H. Warder read some extracts from his annual report. At the close of 1909 the membership was 1,085; at the close of 1910 it was 1,121. Forty meetings had been held in 1910 by the society and its sections. The Electrical Section, organized in 1904, continued its successful joint meetings with the Chicago Section of the American Institute of Electrical Engineers. In 1909 the Bridge and Structural Section was organized. Last year the Hydraulic, Sanitary and Municipal Engineering Section was organized. Notable additions had been made to the society's library, which is a free public reference library.

Mr. Alvord then made his retiring presidential address, for the keynote of which he took the enobling character of the engineer's work. The charm of life is found in service for the improvement of mankind. The labors of the engineer are distinctly of this nature. There are three important reasons why his work is enobling. First, because he is the original conservationist in rendering the resources of nature available for the benefit of man; second, because he is the missionary of science in applying its principles and making them useful in supplying the wants of man; third because he is a creator in putting the products of his imagination first on paper and finally into material form. Engineers, however, frequently are not appreciated to anywhere near the extent that their calling deserves. Some common reasons for this state of affairs are that engineers too often become engrossed in the details of their work and do not show interest in general affairs; occasionally they do not act loyally to the ideals of their professions in relation to their fellow engineers; and sometimes they place the dollar ahead of their professional standing.

President-elect O. P. Chamberlain assumed his duties with a brief address on some of the activities of the society. The new constitution provides for six classes of membership: honorary, active, associate, affiliated, junior and student members; the junior members will advance to the associate and finally active class; the student and affiliated memberships provide for those not directly engaged in engineering work. The society covers all branches and permits the specialists to discuss their particular problems in sectional meetings. The latter have increased in numbers to such an extent that it has been difficult to find space in the Society's *Journal* for their publication. The latter will therefore be published monthly hereafter except during July and August.

Charles E. Merriam, member of the Chicago City Council, and chairman of a commission investigating city expenditures, made an impressive address on "Municipal Engineering." He reviewed the work of the commission, which has been going on about one and one-half years, with the aid of noted engineers and experts. Twenty reports on its findings have been made public, ten relating to the department of public works. Great extravagance was found in nearly all departments and in many cases evidences of crooked work. Three causes seemed to lie at the bottom of this state of affairs—politics, graft, lack of system and orderly conduct of business. The remedy lay in the segregation of politics and the business of a city and the appointment of skilled engineers to do the engineering work unhampered.

George C. Nimmons, chairman of the Chicago Chapter of the American Institute of Architects, spoke on the new series of uniform contracts that has been drawn up after several years of deliberation. These contract forms have been prepared with great care to eliminate possible loopholes and are recommended for general use in engineering as well as building contracts.

W. H. Finley, assistant chief engineer, Chicago & Northwestern Railway Company, in response to the toast, "Has the Engineer Arrived?" declared the engineer is certainly coming to his own and he saw no reason why he should not receive greater appreciation in the future.

T. W. Snow, president of the Otto Gas Engine Works, spoke briefly of the aid that engineers could give to stopping the present clamor against corporations and business interests that is hampering the industrial world.

St. Louis League of Electrical Interests.

The second annual meeting and dinner of the League of Electrical Interests of St. Louis was held at the Missouri Athletic Club on the night of January 10. H. H. Humphrey was elected president, succeeding Captain Robert McCullough, and F. D. Beardsley, of the Union Electric Light & Power Company, was elected secretary, succeeding Walter Robbins.

After the election of officers and the reading of the reports of the secretary and treasurer for the last year, the meeting was taken in charge by the entertainment committee. The entertainment consisted in throwing upon a screen amusing caricatures of twenty-seven members of the League, and as the cartoons were displayed a spot light was thrown upon the member and he was compelled to make a speech. These cartoons were drawn by Mr. Donnell, cartoonist of the *Globe-Democrat*. The cartoons were all well executed and this feature proved to be very entertaining. The entertainment was followed by music, vaudeville and singing. The dinner was attended by 170 members of the League, the assemblage being very representative of the electrical industries about St. Louis.

The executive committee of the League entertained the executive and program committee of the Missouri Electric, Gas, Street Railway and Water Works Association at a luncheon at the Missouri Athletic Club on Tuesday, and they were also the guests of the League at the dinner in the evening. Arrangements were made for the state convention of the Association to be held at St. Louis April 13, 14 and 15. The committee representing the Association consisted of President J. R. Irwin, Marshall, Mo.; Dean H. B. Shaw of the University of Missouri; F. G. Murray, Louisiana, Mo.; Secretary N. J. Cunningham and Mr. Bixby of Springfield, Mo.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

ELEMENTS OF POWER-STATION DESIGN—XX.

SUBSTATIONS.—II.

BY W. B. GUMP.

Auxiliary Appliances.—These include apparatus such as air-compressors, blowers, oil pumps, oftentimes a small motor-generator independently operated, and in many cases a storage battery. An independent motor-generator and a storage battery are important adjuncts in a substation in the event of a complete shutdown, and may be considered as an investment which is insurance against such disaster. A storage battery is a useful auxiliary for many purposes. Some of these are: As a source of current in case of shutdown; for operating switches; for lighting the station; for general testing purposes. The problems relating to storage batteries will be discussed more fully in the chapter entitled, "Storage Battery Plants."

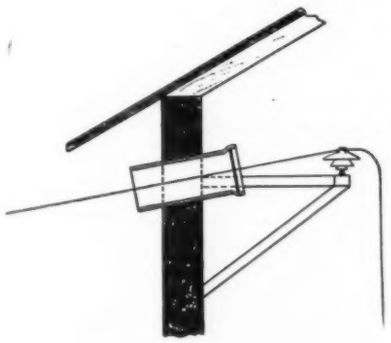


FIG. 3.

(d) The character of design of the high-tension details is related vitally to the operation of the system, and hence must be given careful study. It is well first to deal with the design of line entrances. These are of so great a variety that only the most prominent will be treated.

One of the simplest methods of bringing the line into a station is shown in Fig. 3, which is self-explanatory. Here a common terra-cotta pipe section is secured in the wall and given a slant sufficient to drain all moisture toward the outside of the building, the wire being held rigidly at the center of the opening.

A circular glass plate is placed at the inner end of the pipe to prevent rain from entering. This scheme is effective for potentials up to 30,000 volts, but is not recommended for higher voltages, for three reasons: First, there is a tendency to breakdown near the glass plate, due to "creeping"; second, birds have an opportunity to lodge in the opening, causing grounds; third, dust may readily accumulate on the glass, which is difficult to keep clean, and if not given attention a breakdown will follow. The glass plate is more often an objection than an advantage, and should not be used with this method of construction.

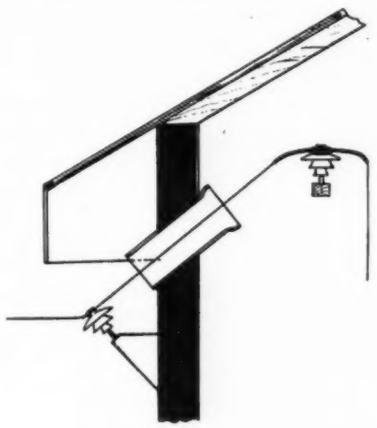


FIG. 4.

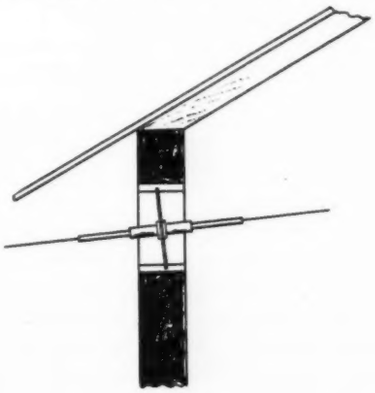


FIG. 5.

Tile pipe without any circular plate is used at the present time in some parts of the Pacific coast for potentials up to 50,000 volts and seems to give good service. Considerable improvement may be had by slanting the pipe toward a vertical position, as shown in Fig. 4. In this construction the roof is extended, so as to house the entrance pipe more completely and decrease the possibility of damage from birds and from rain and dust. It is still open to the objection that birds may lodge in the opening.

A method superior in some respects to the one just described brings into use a bushing composed of fiber conduit or its equivalent. Observe Fig. 5. The bushing is held in position by means of a heavy circular disk, usually of glass, but in some recent installation an insulating composition is used instead. This method offers added protection in having the wire insulated from the disk, but it is not proof against creeping. This may be reduced, however, by employing a more elaborate bushing, such as that shown in Fig. 6. In order to add mechanical strength it is advisable where disks are used to have more than one. Fig. 7 illustrates this construction.

FIG. 6.

Bushings have come into use extensively during the past five years and their construction has been undergoing some radical changes and improvements, necessitated by the use of higher potentials. To go into a long discussion of

details is not permissible here, but it is well to take up a few important points. Fiber conduit is the cheapest and most widely used material for supporting high-tension wiring, and lends itself readily to the construction of special bushings. The chief item to be observed

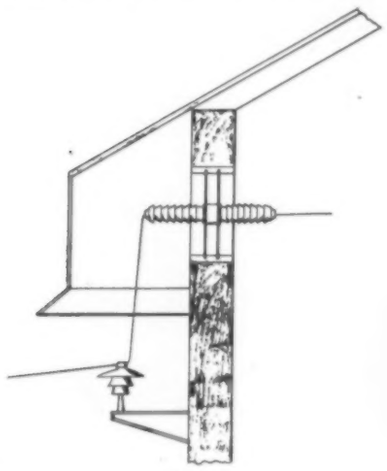


FIG. 7.

with reference to fiber conduit as an insulator is that it is not proof against ill effects of moisture when subjected to high potential. In this respect porcelain offers a distinct advantage over fiber, but due to its brittleness porcelain is not as dependable where either material can be located in a permanently dry place. For very high potential the lines may

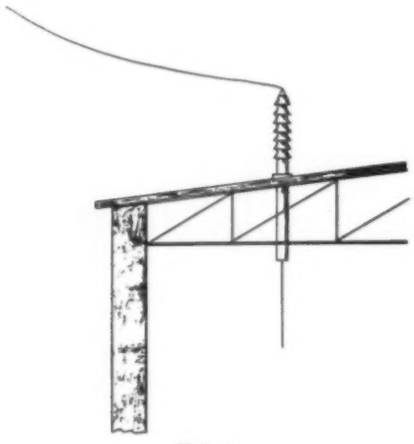


FIG. 8.

be brought into the station as shown in Fig. 8.

The installation of lightning arresters has been discussed at length in a previous chapter. The points to be observed with reference to substations do not differ from those applying to main stations. Installations outside the building are popular, and this method can be followed in the majority of cases.

There are three methods of supporting high-tension wiring: On insulators inclosed in concrete compartments, supported upon a wood structure, or upon an iron framework. The cheapest and one of the best methods is that of supporting upon insulators mounted upon dry wood, since it affords double protection between line and ground. When the insulators are mounted upon metal, entire dependence is placed upon the insulators. The same identical condition exists on a steel-tower transmission line, and since the station equipment is not subject to the same exposure as outside lines the high-tension wiring may be made practically safe with metal supports as with wood. The installation of current transformers, potential transformers and other high-tension apparatus have already been treated in a preceding chapter.

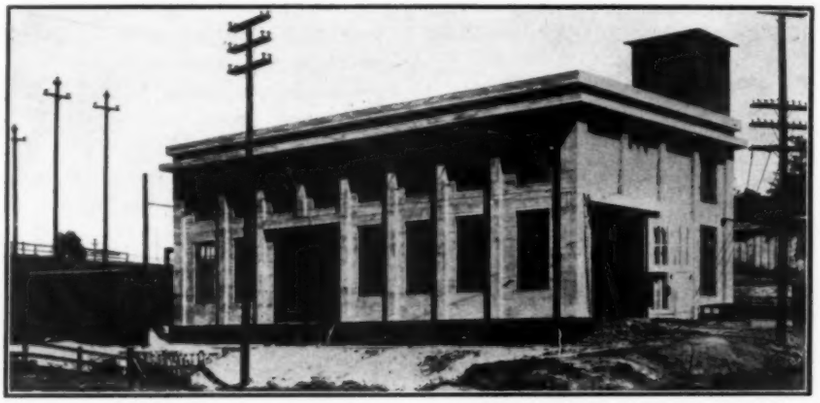


FIG. 9.—TYPICAL REINFORCED CONCRETE SUBSTATION.

(e) The details applying to the low-tension side are discussed in the chapter on distributing systems. Among the features of this portion of the system applying to the present subject may be mentioned the space required for the low-tension wiring. It is important to provide an abundance of space for low-tension cables and for transformers, regulators and like apparatus, so that the station is free from congestion after extensions are made.

(f) The building should be well adapted to the installation of electrical apparatus; second to this it should have the necessary architectural qualities to harmonize properly with the engineering requirements. Though not always conceded, it is a fact that the external appearance of a power station or substation is an advertisement for or against the best interests of the company selling power, and if this item were more carefully observed than is usually the case a general improvement would result in the central-station industry. Too often the building is so slighted that the atmosphere in and around the station is demoralizing, and indicates, or appears to indicate, that the management has not been willing to contribute its part toward meeting the requirements of first-class service. It is to be hoped that the future will show a vast improvement in this respect, and that this is forthcoming cannot be doubted, since central-station managers and financiers are bound to reap a harvest from an enterprise which is prepared to show some

FIG. 10.—SWITCHING STATION.

personal pride in the outward appearance and manner of conducting business.

(g) Typical substations are shown in Figs. 9 and 10 as general samples, the details of which are subject to change, and will, of course, vary widely according to local conditions. It is to be remembered that the personal opinion of the engineer is a strong factor,

and this will often have a marked influence upon the design regardless of certain recognized standards of practice. In regard to the wiring layout of a substation it may be said that the same general rules apply as those applicable to generating stations.

(To be continued.)

[EDITOR'S NOTE—This important series of articles started in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, September 3, 1910, and will cover every phase of central-station design. The treatment is elementary and withal practical throughout, and the complete series will constitute a standard and reliable treatise on this important subject. The next installment will be in the issue of February 4.]

Extensive Use of Coal Briquettes in Germany.

The comparative absence of smoke in Berlin is due partly to the use of fuel briquettes. An American consular agent states that thirty per cent of the coal fuel consumed in that city and its suburbs is brown coal briquettes, and it has been technically demonstrated that, having been produced without the addition of a special binder, they burn with less smoke than any other briquettes. Considerable coke is also used in Berlin.

The coal briquettes produced in Germany increased from 9,250,000 tons in 1901 to about 16,300,000 tons in 1907, while the production in 1910 will exceed 18,000,000 tons.

Production of Copper in 1909.

The United States Geological Survey Press Bulletin, George Otis Smith, director, presents the following report, by B. S. Butler, of the production of copper in 1909.

The statements of the production and consumption of primary copper in the United States in 1909 have been compiled by the United States Geological Survey from statistics of production procured by the Bureau of the Census and the United States Geological Survey, acting in co-operation, and from the records of the Bureau of Statistics. As the metal statistics collected by the Bureau of the Census were obtained in connection with the general census of the industries of the United States, by direct visitation of field agents, the time required for the work was much greater than has been necessary in previous years; this accounts for the late appearance of these final figures of production.

The production of blister copper in 1909 from ores mined in the United States was 1,092,951,624 pounds, the largest output in the history of the industry, exceeding that of 1908 by 150,380,903 pounds, or 15.95 per cent.

In the following table the production is apportioned to the states in which the copper was mined. The total is made up of the fine copper content of blister produced and of the smelter output of ingot and anode copper from Michigan. The production of 1908 is given for comparison.

PRODUCTION OF COPPER IN THE UNITED STATES IN 1908 AND 1909.
(Smelter output in pounds fine.)

	1908	1909
Alaska	4,438,836	4,057,142
Arizona	289,523,267	291,110,298
California	39,643,835	53,568,708
Colorado	13,943,878	11,485,631
Idaho	7,256,086	7,096,132
Massachusetts	7,863	.....
Michigan	222,289,584	227,005,923
Montana	252,503,651	314,858,291
Nevada	12,241,372	53,849,281
New Mexico	4,991,351	5,031,136
North Carolina	29,391	120,451
Oregon	271,191	245,403
Tennessee	19,710,103	19,207,747
Utah	71,370,370	101,241,114
Virginia	25,087	231,971
Washington	162,201	120,611
Wyoming	2,416,197	433,672
Maryland	.....	.....
Alabama	.....	.....
South Carolina	30,488	.....
Texas	.....	3,456
South Dakota	.....	41,988
Pennsylvania and New Hampshire	135,139	1,083,033
Missouri and unapportioned	1,580,831	2,159,636
	942,570,721	1,092,951,624

The total production of new refined copper in 1909 was 1,391,021,454 pounds. This also was the largest output in the history of the industry, exceeding that of 1908 by 253,059,046 pounds.

In addition to the 1,391,021,454 pounds produced from primary sources, the regular refining plants recovered 14,598,065 pounds from secondary sources, making a total output of 1,405,619,519 pounds for these plants. Plants treating secondary material exclusively recovered 74,848,167 pounds as copper and copper alloys. If this is added to the output of the regular refineries, the contribution of the United States to the world's supply of copper is found to be 1,480,467,686 pounds.

Returns from all smelting and refining companies show that the following stocks of electrolytic, Lake, and casting copper were on hand at the beginning and end of the year 1909:

STOCKS OF REFINED COPPER, IN POUNDS.

January 1, 1909	121,876,759
January 1, 1910	141,486,244
Increase during 1909	19,609,485

In addition to the stocks of refined copper, there were at smelters, in transit to the refineries, and at the refineries blister copper and material in process of refining to the amount of 234,013,843 pounds January 1, 1909, and of 266,754,808 pounds January 1, 1910.

The apparent consumption of refined new copper in the United States in 1909 was about 688,500,000 pounds; in 1908 it was about 480,000,000 pounds.

The method employed in determining the amount of copper retained for domestic consumption is shown in the accompanying table. It does not include stocks of copper held by consumers.

DOMESTIC CONSUMPTION OF REFINED NEW COPPER IN 1908 AND 1909, IN POUNDS.

	1908	1909
Total refinery output	1,137,962,408	1,391,021,454
Stock at beginning of year	125,745,796	121,876,759
Total available supply	1,263,708,204	1,512,898,213
Refined copper exported	* 661,876,127	* 682,846,726
Stock at end of year	121,876,759	141,486,244
Total withdrawn from supply	783,752,886	824,332,970
Apparent consumption	479,955,318	688,565,243

*Exports of pigs, bars, ingots, plates, etc., reported by the Bureau of Statistics.

The production of electrolytic, lake, and casting copper from primary sources for 1908 and 1909 is shown in the following table:

PRODUCTION OF REFINED COPPER FROM PRIMARY SOURCES IN 1908 AND 1909, IN POUNDS.

	1908		1909	
	Domestic origin.	Foreign origin.	Domestic origin.	Foreign origin.
Electrolytic	629,392,864	218,716,268	778,808,910	323,085,954
Lake	222,289,584	.....	227,005,923	.....
Casting	67,428,966	134,726	59,750,088	2,370,579
Total output domestic refineries	919,111,414	218,850,994	1,065,564,921	325,456,533

The figures for Lake copper for 1909 include 31,500,113 pounds of Lake copper that was electrolytically refined. A small amount of Lake copper was refined at an eastern refinery and placed on the market as electrolytic copper. The corresponding figures for 1908 include 26,786,485 pounds. "Casting copper" for both years includes blister copper that was exported without refining.

If the 14,598,065 pounds of scrap copper produced by the regular refining companies is added to the output from primary sources, it is found that these plants delivered to domestic consumers 703,163,308 pounds of copper. By adding to this amount the 74,848,167 pounds recovered as copper and in alloys by plants treating secondary metals exclusively, it is found that a total of 778,011,473 pounds of new and old copper was available for domestic consumption.

ELECTRIC LIGHTING and ILLUMINATING ENGINEERING

Annual Meeting and Dinner of the Illuminating Engineering Society.

The installation of officers of the Illuminating Engineering Society takes place in January of each year in New York City and the custom of preceding this by a dinner was continued this year, both being held in the rooms of the Machinery Club, at 50 Church Street, on the evening of January 13.

At the conclusion of the dinner President E. P. Hyde introduced in turn W. W. Freeman, L. B. Marks and C. H. Sharp, who spoke briefly on the early developments of the Society.

General Secretary Preston S. Millar read an abstract of his somewhat voluminous annual report on the work of the Society during the past year. The principal points of his report might be summed up as follows: Membership January 1, 1910, 1,045; members elected during year, 650; members resigned, 76; members dropped, 82; members deceased, 7; membership, December 31, 1910, 1,530. Although the membership passed through a marked development as to numbers, the representation remains about constant: Electrical men, sixty per cent; gas men, twenty per cent; miscellaneous, twenty per cent.

A summary of the papers presented at the various meetings during the past year showed the somewhat unlooked for fact that there had been thirty gas and twenty-six electrical papers read. The attendance at the section's meetings showed Philadelphia still in the lead with an average attendance of 85, Chicago second with 50, New York 45 and Boston 25.

The treasurer, W. C. Morris, gave a brief statement covering the Society's financial conditions, which were found to be satisfactory.

Dr. Hyde then announced the election of officers for the year 1911 to have resulted as follows:

President—Arthur E. Kennelly, professor of electrical engineering, Harvard University, Cambridge, Mass.

Vice-Presidents—H. E. Ives, physicist, National Electric Lamp Association, Cleveland, O. (representing the Chicago Section); J. T. Maxwell, general agent, Philadelphia Electric Company (representing the Philadelphia Section); T. H. Piser, Welsbach Company, Boston, Mass. (representing the New England Section).

General Secretary—P. S. Millar, Electrical Testing Laboratories, New York City.

Treasurer—V. R. Lansirgh, Holophane Company, New York City.

Directors—J. C. D. Clark, Peoples Gas Light & Coke Company, Chicago; F. N. Morton, United Gas Improvement Company, Philadelphia; Arthur Williams, New York Edison Company, New York City.

The result of the election, which was uncontested, showed that Mr. Millar was again the most popular candidate, as he received more votes for his office than any of the other candidates did for theirs.

Dr. Kennelly was unable to be present. As his representative, Mr. Lansingh took the chair, and after a few remarks declared the meeting adjourned.

Candlepower on Alternating and Direct Current.

In a paper in the London *Electrician*, Vol. 58, p. 318 (1906), J. T. Morris reported some experiments showing a difference in the candlepower of a carbon-filament lamp on direct and alternating circuits, when supplied with the same power. At thirty cycles, the difference in a five-candlepower, 220-volt lamp was two per cent, the candlepower being higher on alternating current, while the voltage was lower. At the same effective voltage, the difference would be three per cent. No effect was observed at sixty cycles nor with two 25-candlepower, 110-volt lamps, one of carbon and one of tantalum. These results are of interest in connection with the results on tungsten lamps, reported in an article in these columns last week.

Tantalum Lamps on Chicago Railways Cars.

The Chicago Railways Company, after a series of comprehensive investigations, has installed tantalum lamps in nearly 1,000 large pay-as-you-enter cars. The investigations have shown an average saving of not less than five cents per car day on the generous basis of 1,800 hours of illumination per car year. This now means a saving of $18,000 a year, and fully $35,000 will be saved when tantalum lamps have been installed in the 2,000 cars finally to be operated by the Company. The higher cost of tantalum lamps over carbon lamps, including interest, is found to be balanced at the end of the first year by the longer life of the metal-filament lamps, and the saving is shown in reduced power consumption. This is a particularly important feature for a company which purchases power, as does the Chicago Railways Company, and pays a premium on peak loads, since in the winter months the lighting of the cars during the evening rush greatly increases the maximum current demand for the system.

Electric Lamps in the Navy.

In his annual report, the chief of the Bureau of Equipment, Navy Department, says that metal-filament lamps of various types were purchased and installed for experimental purposes, but found not to be sufficiently robust for general ships' use. They have been found satisfactory for signaling purposes, and are a great improvement in this respect over lamps with carbon filaments, on account of quick heating up and lack of afterglow. The constant improvement in this type of lamp indicates that it will soon be available for general incandescent lighting aboard ship. The results of experiments have shown the superiority of mercury-vapor lamps over arcs for fire and engine-room lighting, and they have been definitely adopted for this service. Thirty-six-inch searchlights are being generally installed.

New York Section, Illuminating Engineering Society.

Physiological topics claimed the major part of the evening at the January meeting of the New York Section of the Illuminating Engineering Society held on January 12 in the Engineering Societies Building.

The chairman, Dr. A. H. Elliott, faced a goodly sized gathering as he called upon Dr. Nelson Miles Black, of Milwaukee, to read his paper on "Artificial Illumination as a Factor in the Production of Ocular Discomfort."

ARTIFICIAL ILLUMINATION AS A FACTOR IN OCULAR DISCOMFORT.

Dr. Black opened his paper by stating that snow blindness and eclipse blindness have long been known, references having, in fact, been found to them in the writings of the ancients. Since the advent of commercial artificial illumination, however, a new form of eye-strain has become manifest, which leads to the impression that it must be due to some defect in our ordinary methods of lighting. The eye-strain referred to is noticed chiefly by those compelled to do close work under artificial light for long periods at a time. Its first symptom is heating of the eyes and slight blurring of the vision. The finer details of objects become lost; sometimes there is actual pain in the eyes and head, dullness of mental activity, and finally almost complete inability to keep the eyes open. Eye-balls and lids show considerable congestion. In order to explain the condition properly Dr. Black summarized what is known of the visual equipment of the eye, laying particular stress upon the construction of the center of the retina known as the fovea. In this portion cones are found, and immediately about it is a ring of rods. The latter contain a pigment known as visual purple, which is very sensitive to light. The range of intensity of illumination to which the eye can adapt itself is enormous, nature having provided in the construction of the eye for an ability to see within the range of the extremely feeble illumination of faint moonlight to the brilliancy of the midday sun. The reflection of bright sunlight from a body of water or fresh snow produces the effect known as glare, which is also noticed to a certain extent in passing from a dark room into a brightly lighted one or into the bright sunshine. It has been stated that ultra-violet light is markedly deleterious to the eye, but it has been found that the various media in the eye are arranged to absorb it and, in fact, the glass globes used in connection with artificial illuminants furthermore absorb these rays. It is also noticed that sunlight contains a larger proportion of ultra-violet rays than any artificial illuminant, and yet ordinary sunlight is not harmful to the eye. It seems, therefore, that the rays from some other portion of the spectrum must be the ones which, when present in our artificial sources in an unbalanced degree, cause the discomfort that has been noticed. Dr. Black gives his opinion that the absence of blue in nearly all sources of artificial light is the cause for this trouble, because blue is the complementary color of yellow and neutralizes it. Since artificial light lacks blue to neutralize its yellow, the latter is in a greater proportion than in ordinary sunlight, and since the yellow rays are very powerful in bleaching the visual purple of the retina, their effect is very marked on the eye. The evolution of the eye to adapt itself to the modern conditions has not gone to a sufficiently great extent on account of the relatively short period to which it has been subjected to these somewhat unnatural sources of illumination.

The second paper, entitled "Physiological Points Bearing on Glare," was read by Dr. P. W. Cobb, of Cleveland, Ohio.

PHYSIOLOGICAL POINTS BEARING ON GLARE.

Dr. Cobb states that the word glare signifies a dazzling light, or as a verb means to shine with a bright dazzling light. He considers principally that production of glare due to the presence of exposed lights in the field of view. The eye tries to adapt itself so as to ward off the injurious effect of glare, but if continued it is a strain on the muscles as well as the nervous tissues of the organ. It has not been generally appreciated that when looking at a bright filament against the face of a lens, prism or other refracting body, the image is just as bright as the object itself, but usually is enlarged by the refractive power of the medium. Some oculists have contended that the old kerosene lamp was the almost ideal source of illumination, but the modern illuminants are not used as the old kerosene lamp was used. The brightness of the general surroundings should be somewhat less than that of the work being done, but not indefinitely less. The visual acuity is inversely proportional to the angle made by the height of a given test object when it is just visible. Taking up side illumination, Dr. Cobb shows that under some conditions a side source produces increased visual acuity, whereas in more frequent instances it results in a diminuation of the sensibility. The question then arises as to which of two factors is the principal one in causing the deleterious effects of glare. The first is a change in the adaptive state of the retina; the second the effect of scattered light within the eye from a side light-source, acting as a haze thrown over the objects of vision. Both of these causes undoubtedly prevail more or less in many cases, and it must therefore be concluded that scattered light in the eye from a side light-source is a large factor in reducing visual acuity. It probably produces two effects on the sensitiveness of the retina itself, one depending on the extent of the retinal surface stimulated by the side light and somewhat transient, the other evidently the result of the high intrinsic brilliancy of the side light and persistent to a degree after the side light has ceased to act.

The discussion of these two papers was had jointly. It was opened by Dr. Weeks, who stated that the visual purple was extremely sensitive to light and that a reduction of the visual purple depended upon the intensity of the light, while an exhaustion of visual purple was due to lack of time for both pupilary and retinal adaptation. Referring to side lights he cited the Senate Chamber at Albany, N. Y., as a "horrible" example.

Dr. Seabrook, who holds closely to the theory of damage from ultra-violet or chemical rays, reiterated his belief and further stated that the maximum illumination at the eye as given by Dr. Louis Bell, namely 2.5 foot-candles, should not be exceeded.

A. J. Sweet said that glare should be divided into two distinct classes, discomfort and depression of the visual sensation, as we could have one without the other, and vice-versa. Too high general illumination should be avoided, as any light falling upon the retina which was not necessary reduced the efficiency of the eye.

E. L. Elliott stated that although Mr. Sweet's investigations had proven that when a light source was placed at an angle of more than twenty-six degrees from the line of vision there was no visual depression, nevertheless there was decided discomfort.

The final paper of the evening, entitled "Reflection Co-effcients," was read by the author, Paul F. Bauder, of Cleveland, Ohio.

REFLECTION CO-EFFICIENTS.

Mr. Bauder's paper dwells on the need for obtaining more definite data on the absorbing and reflecting values of various surfaces and colors used for decorating rooms. Little attempt has as yet been made to co-ordinate the color qualities of light sources with those of the walls, ceilings, floors and contents of rooms. No artificial illuminant can be said to be the full equal of daylight in regard to intensity, color, direction, brilliancy, volume and diffusion of the light. Daylight effects can, therefore, not be reproduced exactly under artificial light. Little attempt has been made by paint, tapestry and paper manufacturers to harmonize interior decorative materials with the colors of the modern illuminants. Aside from lack of harmony in color, there may be incorrect use of the lighting source, insufficient diffusion, etc., that spoil the effect. Mr. Bauder cited a case where redecoration enhanced the lighting effect in a marked degree. Experiments were made by him in a ten-foot cubical room with various colored surfaces to compare the resulting illumination and thus show the effect of the decorations. As compared with white walls, ceiling and floor, there was an efficiency varying from 43.9 to 53.4 per cent, depending on the type of incandescent lamp used and the color of the room surfaces. The colors had less effect with tungsten than with other incandescents. The absorption evidently was a more noticeable feature than variation of reflection due to color. If different densities and colors of glass reflectors had been used, still greater loss of efficiency would have been noticed.

Owing to the lateness of the hour, the discussion was quite general, covering principally the fact that it was important to take each specific instance and describe the panacea rather than generalize. Those entering into the discussion were Messrs. Ashe, Owens, Jones, Macbeth and Hyde.

The papers to be presented at the next meeting, on February 9, are as follows: "Researches in the Photometry of Mercury-vapor Lamps," by J. C. Pole; "Light and Architecture," by Henry Hornbostel; "The Polar Curves of Finite Line and Surface Sources," by Bassett Jones, Jr.

Chicago Section, Illuminating Engineering Society.

The January meeting of the Chicago Section of the Illuminating Engineering Society was held in connection with the sixth annual Chicago Electrical Show, at the Coliseum, on the evening of January 13. The members and guests first assembled in the restaurant for dinner. The meeting proper was held directly after this in the assembly hall of the Coliseum Annex.

A paper by Dr. Herbert E. Ives, on "Luminous Efficiency," that was originally presented before the Philadelphia Section in January, 1910, was the subject for discussion. A. L. Eustice presented an abstract of the paper.

The paper deals with a complicated problem, because one of its factors is physiological and not physical. Four principal topics are considered—radiant luminous efficiency, total luminous efficiency, mechanical equivalent of light and reduced luminous efficiency. One difficulty encountered is the location of the exact borders of the visual radiation. In flame sources there is much loss by conduction and convection, which are small in electric lamps. The so-called mechanical equivalent of light is different for each light source. The sensibility of the eye is not the same for different colors. Therefore, the terms luminous efficiency and mechanical equivalent efficiency of light are unsatisfactory. In fact a confusing array of terms has been used. There is no real need for expressing a luminous efficiency in percentage.

In opening the discussion, Mr. Eustice called attention to the physiological aspects of the question. The eye is not as analytic as the ear. Radiation extends over some sixty octaves, only one of which is light. While some lights might be highly efficient as regards radiation, they would not necessarily be effective light-sources, on account of the peculiar sensibility of the eye.

J. R. Cravath stated that, while it is easy to determine the mechanical equivalent of heat, it is almost impossible to compute the mechanical equivalent of light. We really do not need this, as the relative lumens per watt gives a good measure of the efficiency. He emphasized the low values of reduced luminous efficiencies that have as yet been attained by even the best illuminants, and showed what enormous strides must still be made.

M. G. Lloyd protested strongly against using the term mechanical equivalent of light at all. It does not mean anything without qualifications and with them it is a misnomer. It is possible to get a mechanical equivalent of radiation, because radiation has a measureable value. The term luminour efficiency, likewise, is a useless term. The sensation of light is not proportional to the amount of energy that falls on the eye, because of the peculiar distribution of its sensibility. The common statement that the intensity of light varies inversely as the square of the distance is not true; the radiation energy does vary in this way, but this is not the same as light. The discrepancy is noticeable when photometering lights of different colors.

Chairman F. J. Pearson said he had noticed that the Johns Hopkins lecturers had carefully avoided a discussion of these very things.

George C. Keech said he was impressed more than ever of the need of producing an artificial light as near to natural daylight as possible.

Prof. E. H. Freeman dwelt on the need for agreement on nomenclature and the necessity for measuring the things we speak of. For instance, if we were able to measure the physiological effects, greater progress would be made in illumination.

The subject for discussion at the February meeting will be "Illumination Problems in a Small City." The managers of lighting plants in the smaller cities are frequently thrown on their own resources in solving problems of illumination and generally have shown much ingenuity in doing so. It is hoped to have some of these interesting problems and solutions brought before the Society.

The Neon Lamp.

The new neon lamp mentioned in our last issue has been fully described by Georges Claude at a meeting of the French Physical Society.

Great difficulty was experienced in getting the gas sufficiently pure to give good results, but this was finally accomplished by absorbing the residual gases in the tube by means of charcoal immersed in liquid air.

One of these lamps, operated as a Moore light, was installed in Paris under the peristyle of the Grand Palace of the Champs-Élysées, at the time of the Automobile Show. It consisted of four tubes, each thirty-six meters long, giving a beautiful decorative effect due to the warm red hue.

Some experimental results were given for a tube six meters long and forty-five millimeters in diameter, which operated at 1,000 volts. This voltage varies from 1,100 to 980 when the current is varied from 0.1 to 1.0 ampere. For 1,000 volts the current was 0.94 ampere, and the power 850 watts. The power factor is therefore 0.9. Photometric measurements were made by exposing a short length of the tube, which was found to give 220 candles per meter or 1,320 for the entire tube. The specific consumption is 0.64 watt per candle, or measuring the power in the primary circuit so as to include the regulating apparatus, 0.8 watt per candle.

The results are better in a longer tube, since there is considerable loss of power at the electrodes. Auxiliary electrodes permit this power to be measured and it was found to comprise 300 of the 850 watts. It is therefore expected in tubes thirty or forty meters long to attain 0.6 or even as low as 0.5 watt per candle.

The Illumination Club of St. Paul, Minn.

An organization was formed on January 5, which will be known as The Illumination Club of Saint Paul.

The object of the organization is the advancement of illuminating engineering and the study of all subjects connected with illumination in any form. In addition to the presentation and discussion of papers it is planned that the club shall be a medium of exchange for general illuminating engineering information and data. The secretary will endeavor to collect from manufacturers and others all available data on various light sources and accessories and will keep this information for reference by the members. The usefulness of the organization will be extended in other directions if the membership increases according to present indications.

A program has been prepared for six meetings, from January to June, of this year. These meetings will be held on the second Monday of each month, in the offices of Reed & Stem, 601 Endicott Building. The subject for the next meeting, which will be held on Monday, February 13, is "Street Lighting," and the paper of the evening will be given by Earle D. Jackson.

TELEPHONY—TELEGRAPHY, and WIRELESS.

The Proposed British Transatlantic Cable.

A recent report from a United States consular agent in London, England, states that the proposition to lay a new Transatlantic cable by an extreme northerly route has been again revived, perhaps with more enthusiasm than has attended former proposals. Interest is heightened by the earnestly expressed desire of the Commonwealth of Australia to secure communication with England considerably cheaper by way of Canada.

In 1902 the Pacific Cable Board laid a cable from Vancouver via Fanning Island and Fiji Islands to Norfolk Island, whence it branches to New Zealand and Australia. This board is composed of government representatives of Australia, New Zealand, Canada and the United Kingdom, all of whom shared in the cost of the cable.

Originally the charge from Australia to Vancouver was twenty-four cents a word on press messages, of which four cents went to Australia, eight cents to the Pacific Cable Board and twelve cents to private lines. On August 1, 1909, a reduction to eighteen cents per word was made on press messages. The Board's revenue from press business alone, formerly an almost negligible quantity, has risen to over $1,200 per month since the reduction.

On July 1, 1910, another important step was taken by the Pacific Cable Board. A copper wire between Vancouver and Montreal was leased from the Canadian Pacific Railway, so that now messages may be transmitted directly from Montreal to Australia. The Pacific Cable Board at its recent meeting received an extremely satisfactory account of the progress of the cable toward self-support. In no year since it was laid has the cable been operated without a deficit, which has been made up by the several governments. Original estimates for the year ending March 31, 1911, showed a probable deficit of $312,658; estimated receipts, $622,912; and expenditures, $935,570. Amended estimates put the receipts at $656,977 and expenditures at $922,425, reducing the deficit to $265,448. This adverse balance is expected to be reduced by nearly one-half in 1911.

The project to lay the State-owned Atlantic cable by a northerly route is not new. The route was surveyed as early as 1860 from Scotland via Faroe Islands, Iceland, Greenland and Labrador, along which it is proposed to lay the new cable. An advantage claimed is that this short northern route would have a far greater carrying capacity than those on the longer southern route, and that the same rates which fail to bring any profit for existing Atlantic cables, even when working at their utmost capacity, would earn a satisfactory profit for the northern route if worked only six hours a day.

The longest stretch in the northern route, that between Iceland and Greenland, is about 670 miles, whereas the length of existing Atlantic cables approximates 2,000 miles. It is suggested that whereas the present cable companies charge twenty-four cents per word on ordinary messages, nine cents would be sufficient for the new cable. This would mean probably five cents a word for government, press and deferred messages, in which case twelve cents would cover the cost of similar messages to Australia, omitting land charges.

Although much of the northern route is covered by ice during three-fourths of the year, it is urged that it would not be difficult to effect repairs because of the shallow sea; also that there are no trawlers there, which often cause much damage to cables elsewhere.

The capital necessary for the project is estimated at $4,136,000. The annual receipts at the lowest rate mentioned are estimated at $724,000, the annual working expenses at $268,000, repairs at $58,000, contingencies, canvassing, etc., at $73,000, provident fund at $15,000, and renewal fund at $90,000. This would leave an annual profit of $22,000, or over five per cent on the cost.

It is estimated that cablegrams between the United Kingdom and North America now aggregate about 30,000,000 words, not more than one-sixth of which is between Canada and the United Kingdom.

Two principal motives are helping to swing this scheme. One is the patriotic desire of loyal imperialists to bring together into a more homogeneous whole the various parts of the widely scattered British Empire. The other motive, while primarily commercial, nevertheless merges into the feeling of patriotism and loyalty to the mother country. The Canadian correspondent of the London *Times* says:

"The chief competitor with Great Britain in the Canadian markets is the United States, and there is no denying that the proximity of the United States to Canada gives the United States certain great advantages; chief among them is that goods may be ordered from the United States and received in Canada in a few days. Where goods are ordered by letter, they are a long time coming from Great Britain, whereas they will reach Canada from the United States in six to ten days. If the cable could be employed for ordering goods, and simple codes could be arranged so that a message could be sent for, say, seventy-five cents, the goods could easily reach Canada two weeks after the order was sent and the cost of the cablegram could be made up from the low parcel rates and the preferential customs advantages."

Denmark is likely to be interested also in laying a north Atlantic cable. It has telegraphic communication as far as Iceland, but the new line would bring her into touch with her more western possession, Greenland.

The English press is very enthusiastic over this proposal and the High Commissioner for Australia and the Postmasters General of the Dominion of Canada and of the United Kingdom are quoted as being heartily in favor of the enterprise, so that the project may likely be realized soon.

Wireless in the Navy.

The annual report of the chief of the Bureau of Equipment, Navy Department, states that improvement in the equipment and efficiency of wireless-telegraph installations has been steady and satisfactory. Modern high-frequency apparatus is being purchased for a number of vessels and shore stations. The results of tests indicate that ten and twenty-five-kilowatt sets are better suited for shore stations, where suitable higher antennæ of greater capacity can be used.

The matter of the erection of the high-powered station in Washington has been pending on account of the lack of funds necessary to proceed with the work and the difficulty of obtaining a suitable site.

Several sets of portable wireless-telegraph apparatus have been manufactured for test on the *North Carolina*, *Montana*, and *Chester*. These portable sets are intended to be used during battle, the maximum range to be in the neighborhood of 20 miles. The aerial of the ship's long-distance set could be taken down before battle when the ship was cleared, and the small set used with a wire hoisted to the yardarm, the operator and his small portable outfit being in any protected position—for instance, in the lee of armor inside on the upper deck. It is expected that this type of apparatus can be so developed as to give very satisfactory service for short distances and can be modified for use with landing parties and at lookout stations along the coast.

The work on the coastal stations has been satisfactory as a whole, but many improvements are required, principally in the line of furnishing high-frequency apparatus and more durable masts or towers. It is proposed to use steel towers wherever possible, especially in the tropics. The number of messages handled has increased steadily. Storm warnings, weather reports, and time signals are sent out broadcast as often as obtained, also notices of obstructions, changes of lights, etc. A modern high-powered station has been installed at Colon and is in excellent condition. This station has given very satisfactory results and is able to communicate with Key West every night in the year except in the summer months when static conditions make communication in the tropics irregular. Other stations of similar power are to be erected at Key West and on the island of Porto Rico. It is expected that these stations will afford constant communication between the United States and the stations at San Juan, Guantanamo, and the Canal Zone. The necessity of moving the Colon station to a site on higher ground near the middle of the Canal Zone for communication with ships in both oceans is recognized.

Successful Results of Long-Distance Wireless Telegraphy in Italy.

The recent completion of the powerful Marconi station at Coltano (near Pisa), Italy, has been attended with experiments giving highly satisfactory results. In the presence of representatives of the Ministry of War and the Ministry of Posts and Telegraphs direct communication was established with stations in Ireland and Canada and messages exchanged with the station at Massowa, in the East African Italian colony of Eritrea. A similar station to that of Coltano is to be constructed at or near Beunos Aires and direct communication thus established between Italy and Argentina. From Massowa wireless communication will be maintained with Magadisho, in Italian Somaliland.

An English Windmill-driven Plant.

A church situated near the town of Bilston, England, enjoys the distinction of being electrically lighted with power generated by a windmill-driven generating station. Not only is the church fitted with electric lights, but the organ blower is driven by a small electric motor.

The generator, which is driven by a vertical shaft from the windmill wheel is of a low-voltage type and is supplemented by storage batteries. All of the equipment is automatic in operation.

Exports of Copper.

Exports of copper for the week ended January 12 were 9,041 tons; since the first of the month, 13,501 tons; last year, 10,547 tons.

Professor Jackson Engaged for British Telephone Investigation.

The British Government has retained Prof. Dugald C. Jackson, of the Massachusetts Institute of Technology, president of the American Institute of Electrical Engineers, and senior member of the firm of D. C. & Wm. B. Jackson of Boston and Chicago, as an expert advisor in the matter of the valuation of the plant of the National Telephone Company, which the British Government is to purchase at the end of this calendar year. Professor Jackson sailed for England by the *Lusitania* this week for a preliminary conference with the Post Office officials. Later on he is likely to spend several months in England in active work on the valuation problem. It is understood that no other foreign engineers have been consulted by the British Government.

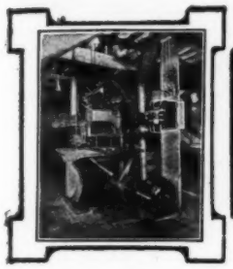
The National Telephone Company is operating under a thirty-one year license which terminates on December 31, 1911. The Company's system includes over 1,500 exchanges and more than 500,000 separate stations or subscribers. Its capital stock is about $60,000,000. The purchase of the Company's plant by the Government will involve a valuation of the entire plant and equipment with special reference to its availability for service as a part of the Government's system of telephones, which will, after next year, cover practically all telephone service in the British Isles. Since 1896 the Government has had possession of the trunk lines of the country, but as lately as 1905 the National Telephone Company carried on about ninety per cent of the telephone traffic within exchange districts.

Current from Refuse.

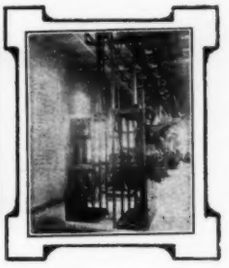
The city of Budapest is considering the erection of a modern plant for the destruction of refuse, the idea being to generate electric current by the combustion of the refuse under steam boilers. Plants of this kind already in existence evaporate from 0.9 to 2.0 pounds of water per pound of refuse.

Regular Wireless Communication.

The *Cedric* has been refitted with powerful wireless apparatus and during a recent trip was in communication with both Europe and America every day of the voyage.

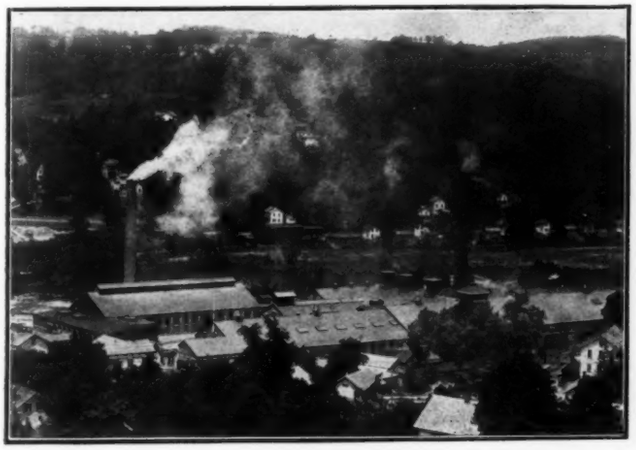


Industrial Power

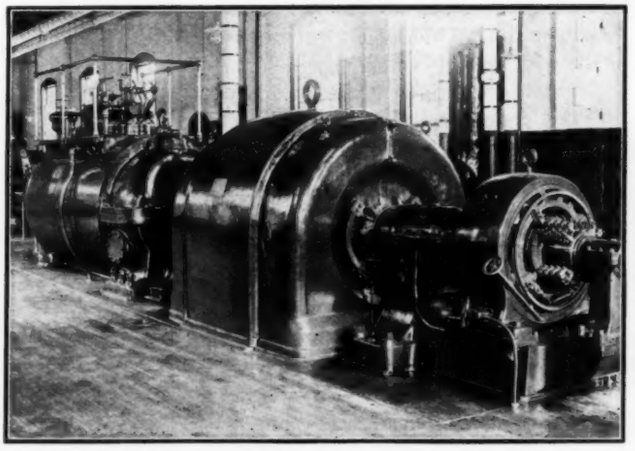


Electric Drive in a Brass Mill.

One of the attractive features regarding electrical drive is the possibility of making a trial in a part of a shop or a plant without later loss of economy in case it is decided to extend the use of electric motors to the entire plant. This is well shown in the case of the Plume & Atwood Manufacturing Company, Thomaston, Conn., which began to use electric drive in 1900 and made the change to electric power throughout in 1907. This company now has what is believed to be the most completely electrically equipped brass mill in the country.



GENERAL VIEW OF PLUME & ATWOOD MANUFACTURING COMPANY'S PLANT.



INTERIOR OF THE POWER PLANT, SHOWING TURBO-GENERATORS.

In 1900 a 200-kilowatt two-phase generator was installed to supply power to various motors in the machine shop, thus replacing the engine drive previously used there. The immediate cause of this change was the distance that the power from the engine had to be transmitted, by belts and line shafts, as the machine shop was at the end of the plant. Although the present well known greatest advantage of electric power in machine shops (the use of adjustable-speed direct-current motors on individual tools) was not obtained, and but a few large constant-speed motors were applied to line shafts, still the service was highly satisfactory and the drive was gradually extended by the addition of a motor here and a motor there for various rooms. But the power for the main rolls continued to be supplied from a large steam engine on the floor of the main shop with steam piped from the boiler house in a separate building.

However, in 1907, it was decided to use electric power throughout the plant and the engine drive was entirely discarded. In the main power house with the old 200-kilowatt generator was installed a steam turbo-generator set of 750-kilowatts capacity together with the necessary auxiliary apparatus. In the shop motors of various sizes were installed to drive the different rolls. Some were placed in pits below the floor and others on the floor. In some cases the motors were geared to the countershaft driving the rolls and in others silent-running chains were employed. The additional installation brought the capacity up to twenty-two motors ranging in size from five to 150 horsepower with an aggregate of 1,300 horsepower.

The immediate result of the electrification was a material increase in the capacity of the plant owing to the speeding up of the rolls. When the change was made the roll speeds were increased from fifteen to 100 per cent with an average of forty per cent. This speedily eliminated considerable overtime work which had previously been found unavoidable. In addition considerable floor space was made available in the shop by the removal of the main engine, and rearrangements and additions made further economies possible.

The change from engine to motor drive was made without an interruption of any sort to the rolling service. The men were able to work through the changes so that the production of the mill was not diminished even temporarily.

In most cases two rolls were driven from a single motor, but in the case of rolls No. 1 and No. 6 and No. 12, through which the first passes are made, a countershaft drives the three rolls, the countershaft being driven by two motors one of 100 horsepower and the other of 150 horsepower. Both motors are connected to the countershaft by silent-running chains and therefore operate in parallel not only electrically but mechanically. Both are standard squirrel-cage induction motors and have operated with perfect satisfaction under these severe conditions with no apparent tendency for one motor to "hog" the load.

The larger of these motors is shown in the illustration with its chain con-

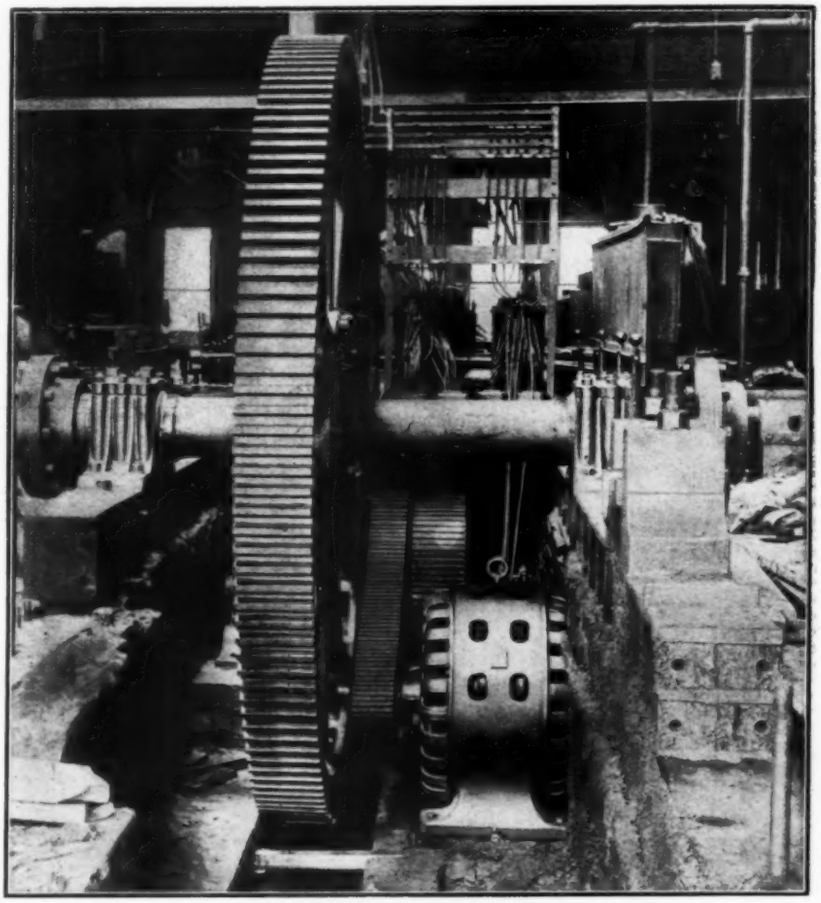
nection to the pinion countershaft. The chain connecting the second motor to the countershaft may be seen, but the motor is hidden. The photograph was taken just after the main engine had been torn out before the floor had been relaid. The flexibility of electric drive is here clearly demonstrated, for 250 horsepower was required, but a motor of this size could not be replaced in the pit without tearing out a part of the foundation, so it was found more satisfactory to use two motors totaling 250 horsepower and placed on opposite sides of the pinion countershaft. This method of connection materially reduced the strain on the bearings of the countershaft. The same method was adopted on one other set of rolls where two motors, one of seventy-five horsepower and the other of 100 horsepower were connected by chain to the same pinion countershaft.

The use of a flywheel was found desirable to smooth out the sudden demands for power when the material entered the rolls. If a flywheel were not used the sudden application of the load would take the slack out of the chain with a snap which would be so violent as to the run the risk of breaking the chain or of throwing it off the sprocket. The flywheel acts as a cushion and the chain takes the load very easily and quietly with only a few slight undulations.

The record of the turbine is interesting. It usually operates ten hours a day, six days a week. It was put in comimssion in October, 1907, and not till a year later was the turbine opened. Then the case was removed and an inspection made of the blades, but no repairs of any sort were made and the turbine is running satisfactorily today. No trouble was experienced previous to the opening of the turbine in 1908, a desire to see whether any wear had taken place being the only reason for inspection. No sign of such wear could be found.

One item of economy due to motor drive on the rolls is of particular moment, not merely from the direct saving in cost of repair parts, but also from the saving in time by freedom from repairs. This is the freedom from roll breakage due to jamming of the work. Previously the rolls were the parts which gave way when work jammed, but with motor drive a fuse lets go first and the total expense for renewal of broken rolls in three years has been zero. In fact, the total maintenance charge of this portion of the equipment of rolls and motors, has not exceeded $25 in that period.

An interesting detail of the shop routine is due to electrical drive. The speeding up of the rolls increased their capacity above the aggregate capacity of the overhauling machines so that overtime has been required with these machines at different times. To obviate the necessity of running the large turbine to supply the twenty-horsepower motor in this room a direct-current



MOTOR DRIVING BRASS ROLL.

motor is also installed where the belt from the alternating-current motor can be readily shifted to it. The direct-current motor is supplied from a small steam-engine driven generator previously used as the exciter for the original 200-kilowatt engine-type generator.

The electrical apparatus was all made by the Westinghouse Electric & Manufacturing Company, Pittsburg, Pa. The Plume and Atwood product includes brass wire and rods, as well as sheet brass of varying gauges.

An Electrochemical Cyanide Process.

At the December meeting of the New York section, American Electrochemical Society, John C. Clancy described his new cyanide process for refractory ores, making use of electrolysis.

The ore is crushed by stamps, rolls, ball mills, or any other efficient form of preliminary grinding mills. The degree of fineness necessary for the process is about 100 mesh. The ore is crushed in the cyanide solution containing calcium cyanamide, sulphocyanide, and the halogen salts; it is, therefore, under the influence of straight cyanide treatment practically after leaving the rock breakers until it reaches the agitation tank. In the agitation tank it meets with electrolysis, which acts upon the cyanide containing the additional chemicals in solution, forming powerful solvents for the precious metals as already described. The treatment solution is made up to 2,000 pounds of water containing one pound of cyanide, two pounds of alkaline sulphocyanide, two pounds of calcium cyanamide and one-half pound alkaline iodine. The prod-

uct leaving the rolls is fed into the tube mill and converted into a pulp, by feeding the mill with the treatment solution and ore in the proportion of one part of ore to one part of solution. The discharged pulp after separation of the oversize is transferred to the agitation tank to undergo electrical treatment.

The conductivity of the pulp is adjusted by adding common salt until the required voltage is obtained; twenty pounds of salt per ton of solution will invariably decrease the resistance of the pulp so that the voltmeter will register about five volts. In the majority of cases a current of about 50 amperes per ton of ore is adequate. It will be easily seen that the cost for electrical energy is not by any means prohibitive. With iron-oxide electrodes it is possible to obtain a current density considerably over 50 amperes per square foot of anode surface, so that one electrode 3 feet in length by 3 inches in diameter will be sufficient for the treatment of from three to four tons of ore, in other words, approximately thirty of these iron-oxide electrodes would be required for the treatment of 100 tons of ore per day. If the treatment tank is constructed of iron the tank itself may be used as the cathode. This arrangement would, of course, decrease considerably the cost of installation. The electric generator is the chief item of cost, a low-voltage generator, say, a ten-volt machine capable of giving the necessary amperage can be obtained at any of the electrical warehouses. It is obvious, therefore, that the process may be applied to any existing fine grinding plant provided with agitating tanks. All that is necessary is simply to introduce the electrodes into the circulating ore pulp containing the necessary chemicals and switch on the current. It is essential in every case to maintain the alkalinity, i. e. protective alkalinity, at about one-tenth of a pound alkali per ton of solution so as to allow of the formation of cyanogen iodide and cyanamidogen iodide. About eight hours' treatment under electrolysis usually is sufficient to obtain the necessary extraction.

After the eight hours' treatment with the current, the pulp solution is brought up to about one pound per ton of protective alkalinity by adding caustic soda, and the cyanide contents regenerated up to about 0.5 to 0.6 pounds cyanide per ton of solution. The regeneration of the cyanide is then accomplished simply by giving the pulp about two hours more current. It will be understood that the reason for adding the extra alkali, is that cyanide regeneration cannot take place in the presence of a halogen compound unless the solution containing sulphocyanides and cyanamide is made alkaline.

The cost of the chemicals in one ton of electrolyte is as follows:

1 pound of cyanide.....	18 cents
2 pounds of cyanamide....	6 cents
2 pounds of alkaline sulphocyanide	12 cents
0.25 pounds of alkaline iodide.	35 cents
Total	71 cents

This would not represent the total cost of one ton of solution, for, notwithstanding the effect of electrolysis, practically all the haloid salts previously added, together with the sulphocyanide will be found unimpaired at the end of the operation, the cyanide and cyanamide alone suffering the necessary decomposition. The amount of cyanide consumption on the ore in presence of cyanamide works out at about one pound of cyanide per ton of ore treated. This consumption of cyanide is regenerated at the expense of three cents for cyanamide and at the very outside three cents for current (figuring current at one cent per kilowatt-hour), making a total cost of six cents per ton of ore.

The cost of electrical energy works out at about ten cents per ton of ore treated, this added to the cost of cyanogen-bearing material and regeneration, would make a total of 16 cents per ton of ore.

Ozone for Sterilization.

A plant for purifying the water from the Neva River has recently been installed at St. Petersburg, at a cost of approximately $750,000. After being filtered, the water passes through an ozonizing apparatus. This method of sterilization is rapidly growing in favor in Europe.

Electrification in Finland.

It is reported that the water of Sarina Lake, in Finland, is to be used for generating electric power. A London firm has applied for the concession and proposes to electrify the Finish railways and supply current to Helsingfors and St. Petersburg. The capacity planned is 168,000 horsepower.

A Unique Emergency Plant.

One of the most ingenious applications of storage batteries for emergency work was made during the large fire at Minneapolis recently.

The destruction of the Minneapolis General Electric Company power house deprived the plant of the *Daily News* of current, and the Studebaker Brothers Company, located directly across the street from this newspaper office, came to their rescue in a novel manner.

The power required for the *News* linotypes was 220 volts. In twenty minutes' time the Studebaker Company unloaded from its electric trucks 105 electric vehicle batteries. These were placed on a large truck which was stationed on the street just outside of the composing room. Wires were run into the building from these batteries and for the first time on record an electric automobile started to work in getting out a newspaper.

The evening edition of the *Minneapolis Daily News* for January 6 owed its existence to this improvised power house made up of electric vehicle cells.

Acyclic Generators.

J. E. Noeggerath, consulting engineer, gave a lecture before the Electrical Engineering Society of Columbia University, on the evening of January 6. The lecture described the principles on which the acyclic machines are built, the method of connecting the conductors in series to give commercial voltages. It was stated that machines could be built for voltages as high as 600 and with an efficiency as high as 93 per cent. The larger the capacity of the machine the better the efficiency, and therefore this type of machine is particularly adapted to large sizes.

Arch Lighting Proposed for Eugene, Oregon.

The Oregon Power Company has proposed the erection in Eugene, Ore., of a set of tungsten arches for lighting the principal streets. This lighting is now done by carbon incandescent-lamp streamers aggregating 200 nominal candlepower per streamer. These would be replaced by strings of ten series tungsten lamps of thirty-two candlepower each, thus increasing the light over fifty per cent. It is proposed to hang each string of lamps from a messenger cable so as to form an arch.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

LEHIGH VALLEY TRANSIT.

The Lehigh Valley Transit Company reports for the year ended November 30, 1910, compared as follows:

	1910	1909
Passenger receipts	$1,042,969	$956,888
Operating expenses	462,344	648,172
Net	480,625	408,716
Other income	159,851	114,574
Total income	640,476	523,290
Fixed charges	430,276	421,602
Surplus	210,200	101,688

AURORA, ELGIN & CHICAGO.

The report of the Aurora, Elgin & Chicago Railroad Company for the month of November and five months ended November 30 compares as follows:

	1910.	1909.
November gross	$132,508	$122,789
Expenses	74,722	69,526
November net	58,086	52,263
Charges, taxes	34,603	29,586
November surplus	23,483	23,677
Five months' gross	809,583	740,805
Expenses	418,471	372,108
Five months net	391,112	368,696
Charges, taxes	167,043	146,663
Five months surplus	224,069	222,033

NORTHERN OHIO TRACTION.

The report of the Northern Ohio Traction & Light Company for the month of November and eleven months ended November 30 compares as follows:

	1910	1909.
November gross	$ 189,705	$ 175,743
Expenses	110,718	99,972
November net	78,987	75,770
Charges	43,367	43,400
November surplus	35,620	32,370
Eleven months gross	2,235,453	1,994,729
Expenses	1,233,947	1,088,502
Eleven months net	1,001,506	906,227
Charges	476,894	480,856
Eleven months surplus	524,612	425,371

UNITED RAILWAYS OF ST. LOUIS.

The report of the United Railways of St. Louis for the month of November and eleven months ended November 30, compares as follows:

	1910	1909
November gross	$ 952,871	$ 923,427
Taxes and depreciation	628,117	581,014
November net	324,754	342,413
Other income	3,556	4,023
Total income	328,310	346,436
Charges	232,151	232,107
November surplus	96,159	114,329
Eleven months' gross	10,553,912	10,154,366
Taxes and depreciation	7,068,288	6,426,687
Eleven months' net	3,485,624	3,727,679
Other income	37,928	38,737
Total income	3,523,552	3,766,416
Charges	2,565,514	2,566,006
Eleven months' surplus	958,038	1,200,410

LAKE SHORE ELECTRIC.

The report of the Lake Shore Electric Railway Company for the month of November and eleven months ended November 30 compares as follows:

	1910	1909
November gross	$ 91,802	$ 90,705
Expenses and taxes	50,792	48,984
November net	41,010	41,721
Charges	34,669	35,393
November surplus	6,341	6,328
Eleven months' gross	1,110,541	1,020,021
Expenses and taxes	579,893	538,429
Eleven months' net	530,648	481,592
Charges	382,347	379,939
Eleven months' surplus	148,301	101,653

HUDSON & MANHATTAN.

The Hudson & Manhattan Railroad Company reports for the month of November and five months ended November 30, 1910, as follows:

	Nov.	Jul. 1-Nov. 30
Gross revenue all sources	$362,793	$1,648,709
Operating expenses and taxes	175,866	742,459
Net revenue	186,927	906,249
Int. on total int. bearing bds. oust.	243,958	1,219,790
Less int. chargeable to construction	73,020	365,101
Balance	170,938	2,854,691
Other charges	21,195	103,467
*Total deductions from income	192,133	958,160
Deficit	5,206	51,910

*Total deductions from income being fixed charges applicable against that portion of the property employed in present operations.

EDISON ELECTRIC, BOSTON.

The report of the Edison Electric Illuminating Company, of Boston, for the month of December and six months ended December 31 compares as follows:

	1910.	1909.
December gross	$ 542,463	$ 505,249
Expenses	204,928	202,436
December net	337,535	302,813
Six months gross	2,486,239	2,237,659
Expenses	1,082,525	1,031,460
Six months net	1,403,714	1,206,199

KEYSTONE TELEPHONE, OF PHILADELPHIA.

The report of the Keystone Telephone, of Philadelphia, for the month of December and six months ended December 31, 1910, compares as follows:

	1910.	1909.
December gross	$96,851	$94,790
December net	49,412	47,384
Surplus after charges	24,893	22,665
Six months gross	572,479	551,052
Six months net	287,396	276,968
Surplus after charges	140,327	125,80

Chicago Salesmen of Western Electric Company Have Annual Dinner.

The close of 1910 was observed by the Chicago sales force of the Western Electric Company with an annual dinner at the Chicago Athletic Club on Friday, December 30. About one hundred attended this function, which was considered one of the most successful of the kind ever attempted.

The banquet followed a four days' conference, at which Western Electric standards and problems and topics of interest to all of the sales staff were discussed. The dinner was in the nature of a "get-together" affair and every preparation had been made to insure an evening of social enjoyment. The after-dinner program consisted of songs, speeches and stunts by members of the conference.

Among those at the dinner were F. A. Ketcham, acting manager; H. L. Grant, sales manager; W. J. Doherty, W. H. Tompkins, W. P. Hoagland, J. T. Valenta, H. W. White, D. C. Guest, W. B. Pierce, C. B. Underwood, C. E. Collier, E. H. Cameron, D. G. Welling, T. H. Pither, J. M. Bateman, F. O. Lightfoot, H. D. Haring, C. E. Roberts, G. H. Porter, E. A. Hubbard, W. W. Templin, G. H. Brown, H. B. Hutchins, W. Weiss, J. H. Allen, P. F. Hensel, J. H. Gleason, W. H. Thomas, L. H. Sheetz, A. L. Hampton, J. K. Utz, C. L. Goldin, F. H. Van Gorder, W. J. Murray, O. O. Tucker, C. H. Scribner, E. L. Marmaduke, G. C. Cossman, O. A. Cole, R. M. Hatfield, H. W. Goddard, J. A. Saville, J. D. Edmonds, T. F. Gayer, R. C. Kearsley, G. H. Lounsberry, H. C. Ohmstead, A. A. Keene, A. L. Frankenberger, A. C. Poggi, A. C. Keene, C. E. Scheffner, J. H. Locke, W. W. Anderson, S. G. Ward, C. H. Macklin, A. R. Maynard, G. E. Cullinan, A. L. Perry, H. N. Goodell, J. Valenta, C. C. Eagle, R. Smith, E. R. Gilmore, A. Luce, G. R. Slater, John Young, W. B Minch, J. H. Finley, C. L. Howk, E. A. Phillips, E. Z. Adams, H. B. Vanzwoll, T. J. Rider, Jr., W. F. Bancker, A. W. Green, O. C. Spurling, F. D. Chase, J. C. McDonnell, C. I. DeWitt, J. H. Hellweg, H. R. King, E. A. Hawkins, W. L. Stockton, A. M. Collins, C. W. Holmes, R. A. Barnard, F. B. Uhrig, E. B. Craft, E. M. Hopkins, Hancock Griffin, C. A. S. Howlett and E. T. Sundheimer.

The Western Electric Company's Year.

The Western Electric Company has changed its fiscal year to end December 31, instead of November 30. For the thirteen months ending December 31, 1910, its sales were approximately $66,000,000, as compared with $45,000,000 for the twelve months of last year, and $69,000,000 for the year 1906, which was the largest year in the history of the company.

The increase over the past year has been well distributed over the various lines of merchandise which the company handles, and has been well distributed throughout the United States. The company during the past year has continued its policy of concentrating the manufacturing at Hawthorne, and several millions of dollars have been spent there in new buildings. More new buildings, to cost $1,000,000, have been authorized. The company now employs upwards of 24,000 men.

The first mosque to be lighted by electricity in Ceylon has been built at Colombo. Metal-filament lamps are used.

Electric Commercial Vehicles at the New York Automobile Show.

The eleventh annual show of the Association of Licensed Automobile Manufacturers in Madison Square Garden, New York, contains a striking exhibit of progress in electric commercial vehicles.

In this vast industry the storage-battery car for business use is one of the strong factors in real merit and adaptability to this work, as has been thoroughly demonstrated. The electric wagon is supplanting the horse, by reason of its simplicity of construction and operation, permitting the erstwhile drivers of horse-drawn wagons to exchange the reins and whip for the controller without special training. To these advantages are now added the removal of the storage battery from the plane of experimentation to the solid ground of proved performance on the road. For many years the battery has been the weak point in the electric vehicle, the dubious factor that kept its advocates on the defensive. But the serious utilization of the new Edison nickel-iron storage battery by automobile builders, who are expressing their faith by a substantial guarantee, and the improvement in construction of the older lead types of cells and in methods of handling them in the vehicle and caring for them in the garage, are clinching the success of the electric.

The General Vehicle Company of Long Island City, N. Y., has a very representative exhibit near the main entrance of the show, with the following officials and employees in attendance: P. D. Wagoner, R. McL. Lloyd, G. W. Wesley, C. W. Squires, L. Ruprecht, A. P. Bourquardez, J. H. Cafferty, W. L. Brown and E. L. Cordner.

Two special features are vehicles at the two extremes of size and capacity: a low-priced, 700-pound package delivery wagon, with all-metal body which is unaffected by weather conditions, and which embodies almost without modification the standard, uniform design of the line of heavier vehicles; and a five-ton truck, one of an order of eighteen trucks of 3.5-ton and five-ton capacity for the Peter Doelger Brewery. An interesting vehicle is a steel "Trenton" combination tower and emergency wagon for electric public-service companies, mounted on the standard two-ton chassis. The tower framework is of peculiar telescoping design and when extended forms a ladder to the swivel top. The rear compartment has seats for eight men, and ample space under the seats for tools, etc. Mr. Ruprecht pointed out to the writer the following salient features of General Vehicle Company's practice: Internal expanding wheel-brakes of generous design; side loading or underslung battery, adapted to either the lead or the alkali battery; the use of chrome-vanadium steel in the spring hangers, countershaft hangers, brake supports and elsewhere; standard General Electric completely inclosed motors, a single motor driven by Morse or Whitney silent chain with roller-bearing self-aligning countershaft; roller-chain drive to rear wheels, which run on roller bearings.

Included in the exhibit of the Waverly Company, Indianapolis, Ind., are a 600-pound shaft-driven delivery wagon and a three-ton truck. A feature of the former car is the use of the same high-grade mechanical base as in a four-passenger pleasure car carrying approximately the same load. This construction is not only a manufacturing economy but a satisfaction to the user in the resulting longer life of the car. The controller is of the two-pound contact type with positive non-arcing contacts, similar to those of a knife switch. In the motor, which is totally inclosed, Hess-Bright bearings are used on the armature shaft and Timken bearings on the countershaft, which is driven by Renault silent chain. W. C. Johnson, H. H. Rice, J. C. Henderson, E. C. Brewer and P. W. Eigner are in attendance.

The Detroit Electric (Anderson Electric Car Company, Detroit, Mich.) is in charge of W. C. Anderson, Albert Weatherby, George M. Bacon, Charles S. Hughes, Elliott Higgins, Russell Burnett and E. R. Erkmann. The cars shown are Edison-battery vehicles and are specifically built around this battery, all types having a light steel chassis. The exhibit includes a 750-pound wagon and a five-ton truck, and other types. In all, Hess-Bright ball bearings are used on motor, shaft and countershaft, and Timken bearings on the wheel axles. A countershaft brake is provided in addition to brakes on the two rear hubs, and is worked from a separate foot lever, this being a new feature in electric vehicles, which has proven of considerable value, as it distributes the braking effect and thus prolongs the life of the car. The Company uses controllers of the drum type and motors of its own make. A special feature is a double-pole, double-throw switch mounted on the dash and having three positions—"running," "charge" and "off." This device serves as an emergency switch, giving a means of throwing off the current independently of the controller.

The Studebaker Automobile Company of South Bend, Ind., is showing electric wagons representative of its varied line, which comprises six classes of chassis, ranging from 800-1,500 pounds to six tons in capacity. This Company advocates a two-motor equipment except for the smallest cars, builds its own motors, and equips all its cars with chain drive, roller bearings and ball bearings, and the standard line of chassis equipments are built to suit the individual requirements of purchasers.

Special provision is made for the protection of the battery by a spring suspension cradle, consisting of a rectangular steel frame hung from four round tie-rods set at an angle. On each end of the frame is a heavy double-leaf spring giving four points of support for the actual battery compartment.

The personnel of the Studebaker Company at the show includes J. L. Brooks, W. P. Kennedy, Messrs. McFarland and Caswell, and others.

The Lansden Company, Newark, N. J., has an exhibit and a representation that amply maintains its reputation for able construction and marketing of distinctively Edison-battery business wagons. One of the most attractive exhibits is a much-battered "express wagon" seven years old, which has made 37,000 miles (an average of 295 days in the year) for the Adams Express Company. This venerable vehicle contains an Edison battery four years old and is one of fifteen similar vehicles which were delivered in 1904. The Adams Express Company, which is said to have spent more money on power trucks than any other concern, is now using over a hundred of these wagons.

Among the special distinctive features of Lansden construction are a spiral-spring arrangement designed to eliminate the effects of mechanical shocks, a regenerative controller for charging the battery on down grades, and a six-finger controller.

New Electrical and Mechanical Apparatus and Appliances.

A New Harmonic Ringer.

The Western Electric Company has recently placed on the market a new harmonic ringer, which has proven from actual service that it will satisfactorily meet the most exacting conditions.

This ringer, known as the No. 41 type, operates on the same potential of 140 volts for all four frequencies. This simplifies the harmonic ringing system and eliminates the use of the higher voltages, which have been objectionable in low-voltage telephone circuits and apparatus.

The construction of this ringer is such that no armature adjustment is required after it leaves the factory. The adjustment of the gongs can be quickly, easily and accurately made by means of an eccentric screw. After the adjustment is once made the gongs can be rigidly and permanently set by tightening the screws which lie directly behind the adjusting screw. The very simplicity of the adjustment of this ringer is a unique feature, as the only tool required is an ordinary screw-driver.

The coils of this ringer are wound with black enameled wire, which makes them practically impervious to moisture. This enamel insulation will stand a temperature that would destroy the usual silk and cotton insulation. Because of the decrease in the overall diameter of the wire, due to the use of enamel insulation, the ringer coils can be wound to a much higher efficiency.

The Company states that every detail in this ringer has been especially designed for strength, durability and ease of adjustment with a view of practically eliminating the factor of ringer maintenance in harmonic systems.

Curtis Train-Lighting Turbines for Suburban Service.

The Chicago, Burlington & Quincy Railway Company, after a careful study of its train-lighting problem, has standardized a system or suburban service which is well adapted to meet its requirements.

TRAIN-LIGHTING TURBINE INSTALLED ON LOCOMOTIVE.

The suburban trains, consisting of standarding suburban passenger coaches, are lighted by electricity, each coach being equipped with twenty-one sixteen candlepower lamps. Four lights are furnished for platform illumination, one for the toilet-room and sixteen are placed in the body of the car underneath the deck sash. In the locomotive cab a suitable number of electric lamps are used to illuminate the gages and for portables. The locomotive headlight which has been adopted is a fifty-candlepower carbon-filament stereopticon lamp, arranged with the usual reflector, and is said to give six times as much light as the oil lamp which is usually used in suburban service. There is a marble panel in the cab of the locomotive equipped with a voltmeter and rheostat, the latter permitting adjustment to meet the varying load on the lamp circuit.

The electric current for lighting these trains is supplied by Curtis turbo-generator sets mounted on the locomotives. The sets are iron clad, the covers being clamped in with gaskets, so that they are storm-proof. The turbines take steam at the locomotive boiler pressure on different classes of engines, varying from 140 to 180 pounds, the governor taking care of these variations. The oil cups are large, making it unnecessary to fill them oftener than once a week. The turbine is direct coupled to a 110-volt generator.

In general, operation of these train lighting sets involves only opening the steam valves when it is desired to put the turbines in operation, and closing the valves to shut them down.

Absolute reliance is placed on the electric lighting equipment, as no other

NO. 41 TYPE RINGER, THIRTY-THREE AND ONE-THIRD CYCLES.

NO. 41 TYPE RINGER, FIFTY CYCLES.

means of illumination is provided. The C. B. & Q. Railway Company also uses the Curtis turbo-generator for illuminating its through trains, and at the present time have sixty-seven of these sets on its lines.

The Anderson Carriage Company Changes Its Corporate Name.

The further evidence of the evolution that is taking place in the mode of individual transit is the recent change in the corporate name of the Anderson Carriage Company, Detroit, Mich. The Company will henceforth be known officially as the Anderson Electric Car Company.

Practically the same Board of Directors and offcials are still in charge of the Company's affairs. The new name indicates the progress of the Company in the automobile industry, for which Detroit has a world reputation. The "Detroit Electric" has in the past five years gained a most favorable position in the electric-vehicle branch of the motor car industry.

Storage Battery for Mines.

The Electric Storage Battery Company is installing two large storage battery and synchronous-motor generating sets to meet the hoisting requirements in Nevada mines. One order for 120 cells type G-35 "Chloride" accumulators and a 400-kilowatt synchronous-motor generating set has been received from the Goldfield Consolidated Mining Company, of Goldfield, and the Tonopah Mining Company, of Tonopah, has also ordered 120 type G-31 "Chloride" accumulators to be supplied by a synchronous-motor generator. These are in accord with the Battery Company's system of regulation.

A Notable Lighting Installation.

That the "wire type" tungsten lamp, which was first brought to the attention of illuminating engineers at the 1910 convention of the National Electric Light Association, is making good is well demonstrated by the installations of Westinghouse "wire type" lamps at the Hotel Bossert, Brooklyn, N. Y. By means of these lamps, it is said that some very satisfying lighting effects were accomplished.

As a symphony in impressive architectural and pleasing decorative effects, the Hotel Bossert appeals to the lover of the beautiful. Its exterior is designed in the architecture of the early Renaissance period, the refined and graceful lines of which give to the building that character of quiet elegance which should distinguish a first-class family hotel.

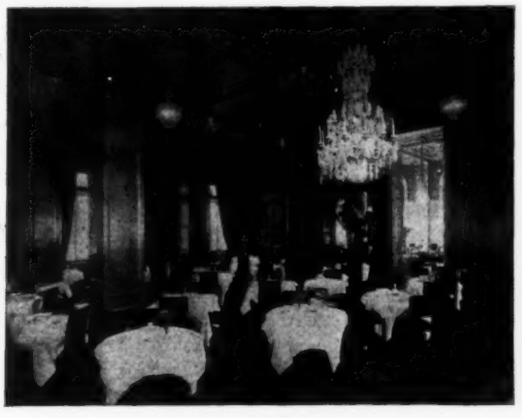
The public entrance lobby is large and well lighted. Indirect illumination is accomplished by means of 100-watt "wire type" lamps concealed in alabaster shades; these shades are hung from the ceiling by bronze chains. The lobby is designed in the Italian Renaissance style; imported Botecino marble columns and pilasters extend to the ceiling, and there is a wainscot of the same kind of marble, twelve feet high. The main staircase from the lobby is of marble, beautifully carved. The ceiling is richly ornamented. The elevator doors are solid bronze.

The artificial light for the spacious dining room is furnished by a large center chandeliers and eight smaller chandelier, all fitted with twenty-five-watt "wire type" lamps and candle miniature carbon lamps. The lamps are mounted at various angles with the vertical. The dining room is located in the southeast corner of the building and furnished in the style of the Francis I period.

The living apartments occupy the second to twelfth floors inclusively. The rooms are of liberal dimensions, with large closets. The illumination in these is furnished by ceiling fixtures and wall brackets.

Helmle and Huberty were the architects of the building, while the electrical work was all done under the supervision of C. O. Mailloux and C. E. Knox, consulting electrical engineers.

INDIRECT LIGHTING IN LOBBY.



LIGHTING IN HOTEL RESTAURANT.

New "Ironclad Exide" Battery for Electric Vehicles.

L. H. Flanders, one of the engineers of the Electric Storage Battery Company, Philadelphia, Pa., announced before the Franklin Institute, on January 3, 1911, the new "Ironclad Exide" battery for electric vehicles. Briefly, his talk covered the following points.

The relative fields for the electric commercial vehicles were indicated, showing that where the length of haul is moderate and traffic congested perfect speed control and safety of the electric car made this the logical type of vehicle, both for pleasure and commercial uses. The co-operation between the vehicle manufacturers, the battery manufacturer and the central station has done much to promote the increased use of the electric vehicle.

The history of the lead storage battery was taken up showing the reasons that the Planté type of plate has not been successful for electric vehicles, and that the pasted plate originally developed by Camille Faure is the plate in general use to-day. The chemical action was shown, this being specially illustrated on the screen by original dia-

grams of Mr. Flanders, these diagrams showing the changes in the positive and negative plates at different points of the cycle of charge and discharge.

The culmination of past experience led to the marketing, in 1900, of the Exide battery, which has became one of the most popular and most generally used batteries for automobile propulsion. This type of battery has been improved from time to time, but its essential principles have remained unaltered. In this battery the positive and negative plates are placed side by side alternately, the negative plates numbering one more than the positive. Between the plates are wood and rubber separators. The jar containing the assembled plates is filled with electrolyte and the cells mounted in trays of the requisite number for the voltage desired. The Exide plates have been manufactured in two standard sizes known as MV and PV. The plates have also been of several thicknesses, one of these being known as the "Hycap Exide." The rating for the plates known as Exide is, roughly, one ampere per pound of complete cell at the four-hour rate. The capacity of this plate rapidly increases in service, so that the initial rating is conservative. The final capacity will be from four and one-half to five hours at the original four-hour rate of current. Equipped with the Hycap Exide plates, a battery for the same weight will give greater output but not as many discharges. The total watt-hours' life of both types is approximately the same.

Several years ago the Electric Storage Battery Company was attracted by the cleam of a Frenchman who first demonstrated that if positive material can be kept in position it would remain active. He accomplished this by utilizing a pencil of lead peroxide surrounding a conducting core and enclosed in a porous tube of such elastic quality that as the active material expanded and contracted, due to changes in its molecular structure, the circular tube compensated for these variations. Thus the positive material was protected and held in position. After careful investigation of this new battery, the American patent rights were obtained, and for several years the Electric Storage Battery Company has been actively but quietly developing this battery in order to adapt it to the demands of commercial use. As a result, it has developed a battery with a positive plate which not only possesses all the desirable characteristics of the Exide, but which has an even greater capacity per unit weight, and which is so constructed that the weight of its active material is reduced to a minimum. On account of its remarkable durability this battery is called the "Ironclad Exide."

The negative plate of this battery is of the same general construction as the standard Exide negative, but is made somewhat thicker in order to withstand the longer life of the Ironclad positive.

Ironclad Exide elements are interchangeable with standard Exide elements, so that owners of Exide batteries can get the advantage of the increased capacity and life of the Ironclad Exide battery. The life of the Ironclad Exide battery will be from two and one-half to three times the life of the standard Exide battery, and the cleaning required will be very much reduced.

Questions of operation were then considered by Mr. Flanders. The lecture was followed by a discussion of unusual interest.

Mesco Electric Toaster.

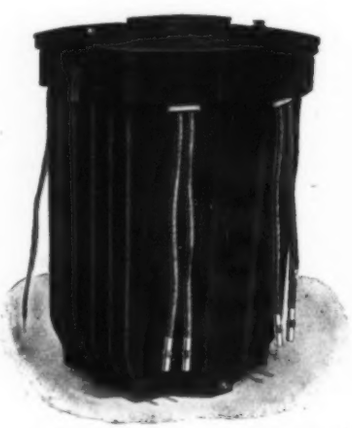
The Manhattan Electric Supply Company, New York and Chicago, has developed and placed on the market an electric toaster equipped with adjustable side doors that hold the bread being toasted. These doors can be placed close to the heating element or can be pulled out any distance desired, thus regulating the operation of toasting.

The toaster is of highly polished nickel-plated brass with a solid porcelain base. It is supplied for either direct or alternating-current service.

Power and Lighting Transformers.

The accompanying illustrations show two views of a new line of power and lighting transformers recently placed upon the market by The Triumph Electric Company, Cincinnati, O. They are built for single-phase circuits, of 60 cycles, but they may be used on circuits of from 50 to 140 cycles. Standard voltages are 1,100 and 2,200 for the primary; 110 and 220 for the secondary. These transformers are of the improved shell-type construction, and possess many important characteristics of especial interest to engineers.

Aside from mechanical construction and durability, transformer losses are the most important consideration in the selection of any particular design. Too often low core-loss values are obtained at the expense of other important characteristics. It is a well-known fact that



TRIUMPH POWER AND LIGHTING TRANSFORMER.

TRIUMPH TRANSFORMER WITH COVER REMOVED.

a disproportionately low core loss will produce excessive copper loss and poor regulation. Similarly, unnecessary insulation is directly responsible for high reactance, poor regulation and a tendency to overheating, the efficiencies being correspondingly low. While core losses are continuous and should be eliminated as far as possible, it is unwise to sacrifice regulation, and increase the copper loss in order to obtain unduly low core loss. Poor regulation means variation of potential at the lamps, in giving rise to flickering and a decrease in the life of the lamps.

Triumph type "L" transformers have excellent regulation, low copper losses and decidedly low core-loss values on account of the superior quality of the silicon-steel used. This steel is non-aging even at temperatures well beyond the safe working limit of the

transformer. The Triumph Company bases its core-loss claims on a sine wave, a well defined and recognized standard.

The type "L" transformers are dried under vacuum and impregnated with a special insulating compound, non-soluble in oil and possessing a very high melting point. Severe tests are carried out on each transformer before shipment, and all apparatus is fully guaranteed by the company.

Hughes Hot Plates.

The success with which the Hughes electric ranges have met has led the manufacturers to develop and place on the market a line of hot plates embodying the same essential features as the ranges, but being particularly suitable where a moderate priced stove is required.

As may be seen in the accompanying illustrations, these plates resemble the ordinary gas or gasoline stove in appearance. They, however, eliminate the disadvantages of these types of burners and in addition combine the features of cleanliness, ease of operation, elimination of heat and poisonous gases and the many other advantages which make electrical cooking popular.

SINGLE AND DOUBLE-BURNER HUGHES HOT PLATE.

The Hughes hot plates are made in sizes of one, two or three burners. They are all equipped with control switches permitting three degrees of heat for each burner. The single burner may be attached to any lighting socket.

The current consumption of the single burner is 125, 250 and 500 watts and the consumption of the two and three-burner stoves is 220, 440 and 880 watts per burner.

The Hughes Electric Heating Company, 225 West Superior Street, Chicago, manufactures these plates.

New Long-Burning Flaming-Arc Lamp.

A new flaming-arc lamp for either direct or alternating-current service, having an electrode life of seventy hours per trim is being placed on the market by the Excello Arc Lamp Company, New York, N. Y. This lamp is particularly adapted for use in steel mills and for street-lighting service.

Both the alternating-current and direct-current types of lamp have vertical electrodes, the long life being obtained by totally enclosing the arc in a manner similar to that used in the ordinary inclosed arc lamps.

The problem of disposing of the fumes arising from the arc which cannot be disposed of by ordinary methods of ventilation is met by the novel arrangement of the globe and burning chamber, as shown in the accompanying illustration. Above the arc itself a long, chimney-like metal tube is arranged, which, owing to its large radiating surface, causes the lighter gases to condense inside it and in the upper and cooler portion of the lamp where the deposit accumulates and is easily brushed out when the lamp is trimmed.

NEW SEVENTY-HOUR FLAMING-ARC LAMP.

Surrounding the arc, inside of the outer opalescent globe, there is a clear cylinder of glass open at the top and bottom. A constant circulation is thus set up and the deposit completely gotten rid of, causing no loss of life at the end of seventy hours burning.

The mechanism of the lamp is housed in a compartment in the upper portion of the casing and is immune from the gases, heat or deposit of the arc. For the direct-current lamp the mechanism is of the differential pattern and of the motor-type in the alternating-current lamp. The electrodes are self-focusing, thus maintaining the arc in a fixed position within the globe.

The current consumption of this lamp is eight amperes and the specific consumption per mean lower hemispherical candlepower is 0.35 watt. The arc electromotive force is about forty to forty-five volts.

These lamps may be easily trimmed. The lower metallic section, including the globe and shade, is removed as one piece. After the lower electrode holder has been drawn down to its lowest position, the upper electrode holder, which fits in the metallic tube, may be reached by a key which passes through a valve opening to a set screw clamping the electrode in place. The lower electrode is inserted in the usual manner and centered with the upper electrode.

Lehigh Valley Extends Its Telephone Train Dispatching.

The success of the telephone train-dispatching circuits recently installed on the Lehigh Valley Railroad has led to further extensions of this new method of handling train movements. A telephone line has just been cut into service between Packerton and Bernice, Pa., the dispatcher being located at Wilkes-Barre. The telegraph will soon be supplanted also between Wilkes-Barre and Sayre, adding about ninety miles more.

The new circuit just placed in operation is known as the eastern end of the Wyoming Division. It connects with about twenty-five way stations, and is approximately 140 miles long. This train wire is divided into three sections, each radiating from Wilkes-Barre. The signaling equipment is so arranged that when a dispatcher calls any station signaling impulses are sent out over that particular section only. One section, which is known as the Mountain Cut-Off, has a special arrangement whereby in the event of any trouble on the train wire it is possible to connect it into the main line, thus fitting the circuit on either side of the trouble and enabling the dispatcher still to get every station.

A complete equipment of telephone and selector apparatus for this new circuit has been furnished by the Western Electric Company.

Electrical Exports for November.

The Bureau of Statistics of the Department of Commerce and Labor, Washington, D. C., has completed its monthly summary of the imports and exports of the United States for the month of November, 1910. From this the following facts relative to the exports of electrical apparatus are taken.

The returns for November show a gratifying increase in every way, both as regards the subclasses (appliances and machinery) and as compared with the preceding month and the corresponding period of a year ago. The figures for this month made it, in fact, one of the leading electrical export months of the year. Although the figures for December are not yet at hand, the total for 1910 is sure to exceed every year since 1907.

Below are given the comparative monthly data bearing out these statements:

	Nov. 1910.	Nov. 1909.	Oct. 1910.
Electrical appliances	$884,326	$584,210	$780,233
Machinery	612,007	470,687	514,184
Total	$1,496,333	$1,054,897	$1,294,417

Electric Lighting in Haiti.

The cities of Port au Prince and Cape Haitien, on the island of Haiti, are now electrically lighted. Although a lighting contract was entered into with the government in 1906, nothing was done until about a year ago, when an American company undertook the work. The contract runs for forty years and grants the company an exclusive monopoly to supply both cities with light and power by electricity. The government agrees to pay seventy-five cents gold per night for each 1,000-candlepower are lamp, of which there are to be 200 in Port au Prince and 150 in Cape Haitien, besides a large number of incandescent lights in government offices, etc.

The Cape Haitien plant is a modern direct-current system, with two direct-connected 125-kilowatt units and two 150-horsepower boilers. The Port au Prince plant is not entirely completed. It will consist of one 200-kilowatt and one 150-kilowatt direct-connected alternating-current units. A mountain stream supplies ample power to the station, two miles from the city limits. All the machinery, wire, lamps, cement for building, coal for fuel and most of the posts were imported from the United States.

A New Electric Sign Flasher.

The Reynolds Electric Flasher Manufacturing Company, Chicago, Ill., is keeping up its reputation by constantly improving and adding to the extensive line of Reco flashers.

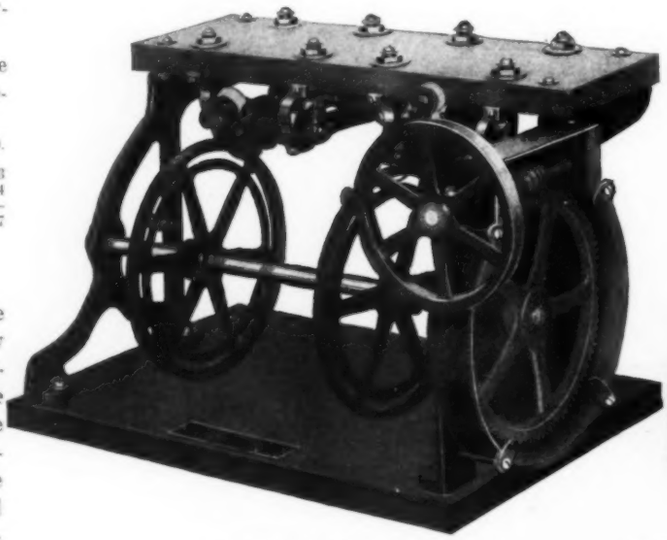
This firm has recently placed on the market a new line of single, double and triple pole "quick-breaking" knife-switch flashers which are simple in construction, free from troublesome parts and require little or no attention.

A number of marked improvements which can readily be appreciated by flasher users are evidenced in the Reco line as made for 1911.

The switches which are made from pure copper, engage in bronze jaws with the well known Reco patent grease reservoir, a safeguard against burning or wear. The grease dissipating the heat and reducing the arc to a minimum as well as continually lubricating the switch blade insures long life.

The switches are opened and closed by a simple and effective purely mechanical method and no spring is employed.

Switch blades and jaws are quickly and easily renewed by the removal of one or two screws. A radical improvement will be noticed in the adjustable feature by which long or short-quick or slow flashers may be regulated to suit any requirement. Switch wheels are provided with slots supporting the rollers which throw the switches in and out and by moving the rollers back or forward adjustments are quickly and easily made. An ordinary screw driver is the only tool necessary. The gearing is inclosed and runs in oil, a dustproof, self-lubricating and practically non-wearing drive.



IMPROVED RECO FLASHER.

FLASHER DRIVE-WHEEL.

Wiring for Automobile Lamp Circuits.

A modern system of electric lighting strictly in accordance with underwriters' rules for wiring houses is part of the equipment of the six-cylinder models of cars manufactured this season by the H. H. Franklin Manufacturing Company of Syracuse, N. Y. This wiring system is demonstrated in the six-cylinder models shown by that company at the automobile shows now being held. Light is furnished by a battery located under the rear seats. From this point the wiring runs in conduits to the lamps. At frequent intervals junction boxes are located. In case of trouble in wiring an electrician can easily test the segments of wire between the junction boxes, thus readily locating the trouble which is repaired with little difficulty.

Lamps which are lighted by electricity are located on the end of the rear fender and in the dash. Lights on the models exhibited at the shows differ from those seen on other cars in that they are in the dash instead of being fastened on the outside. The small electric lamps are set in holes cut in each side of the dash near the top.

Switzerland's Water Power.

The available water power of Switzerland amounts to 1,200,000 horsepower. About 700,000 horsepower of this is either in use or soon will be.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JANUARY 7.—The difficulties between wiring contractors and municipalities, to which I have referred recently, do not show, in some quarters, any tendency to settle themselves, in spite of the conference that is now taking place on the matter. Two corporations are apparently determined to keep the fight going, as they have applied to Parliament for the powers to wire premises, etc., and this action certainly cannot tend to assist the conference to come to a settlement, as it rather gives the impression that the municipalities wish to strengthen their hands in view of a failure. Again, there is some difference of opinion at Islington, in London, where the Electric Lighting Committee's recommendations to wire premises and let out electrical apparatus on hire, have been rejected by the Council. As a result, twelve out of seventeen members of the Electric Lighting Committee resigned and passed a resolution informing the Council that the whole committee did not wish to continue.

A scheme for the construction of a new railway, some fifty-seven miles in length, in the form of a semi-circle on the outskirts of London from East to West, is being proposed, and a company is to be incorporated with a capital of $27,500,000. One of the chief promoters is a well-known capitalist in electrical enterprises, and although specific mention is not made that the line is to be an electric one, yet it may be taken for granted that it will be.

Another extension of electric railway traction in London is the promised conversion of the London, Tilbury, and Southend Railway, whose main line extends about thirty miles out of London. It is proposed to raise additional capital to convert the whole route for electric traction and to sell off the present steam-hauled rolling stock.

There are several systems of automatic electric railway cab signalling in this country, but they have only been adopted practically to a very slight extent. The recent serious accident in the north of England has brought forward the possibilities of such systems of signalling once more, and the moment has been considered opportune for the virtues of a new system of this character to be brought to the notice of the railway companies. It is known as the Brown-Mackenzie system, and its manufacture and installation has been undertaken by no less eminent a firm than Messrs. Armstrong-Whitworth & Company of Newcastle-on-Tyne. The track rails consist of parallel conductors of angle iron, normally in groups of three, with the ends, of course, ramped. These rails, which operate in connection with the apparatus under the locomotive are about three inches above the level of the running rails. I am promised full technical details of the system, which is only just now being brought to the notice of railway companies in this country. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JANUARY 5.—The Bernina electric railroad is one of the most recent to be opened in the north of Italy. It is a single-track road and has a total length of thirty-five miles. The road starts from the locality of Pontresina and mounts up to the Bernina Pass, which lies at an altitude of 7,720 feet above sea level. It then descends to the terminus at the town of Tirano. The present line is run entirely with ordinary rail and by adhesion, and is the highest electric road of this kind in Europe. It serves to connect the Albula railroad with the Valtelline electric railroad system. Current is furnished by the great Brusio hydraulic plant lying in Switzerland near the Italian frontier, using a three-phase 25,000-volt high-tension line and feeding four substations along the railroad. Direct current is furnished by the substations at 750 volts for the trolley line.

Among recent French projects I note that the town of Alençon is engaged upon electric lighting plans in which the local gas company is interested. At Annapes it is likely that the North Electric Company will be awarded the franchise for the lighting. The Tarn River is to afford a supply for the commune of Graulhat and the surrounding region. A hydraulic plant will be erected on the stream and it will be operated in connection with an extensive water filtering and sterilizing plant. At Magny there is a project on foot for local lighting, which will no doubt be done by the gas company.

An extensive piece of hydroelectric work has been lately carried out in the southwest of Sweden on the Lagan River. This stream is one of the largest in the country, and at present there are four turbine plants built upon it, giving a total of 20,000 horsepower. Water is stored in a number of artificial basins so as to secure a reserve supply. Three-phase current is supplied to two power lines working at 50,000 volts, the lines running from Knaered to Halmstad and Trellebord (twenty-five and ninety miles, respectively). A number of towns and villages are then supplied. Some of the towns are shareholders in the enterprise, so that they receive current at lower rates than the other towns. In general a schedule of rates is drawn up which depends on the distance from the central station. It is expected to build other turbine plants on the Lagan River in the near future.

At Darfo, Italy, there is erected a 2,500-horsepower Keller electric furnace for the manufacture of ferro-silicon, and it is now proposed to install a Stassano furnace there. It will probably be of 5,000-horsepower size. It is likely that a Kjellin electric furnace will be erected at Lovere, Italy, for manufacturing steel for projectiles.

An extensive electric plant has been built in Saxony at Gröba and it uses lignite fuel, as it is abundant in this region. Up to the present there are set up three turbine-alternator sets of 5,000 kilowatts and two new groups are to be soon ordered. The voltage on the power line is claimed to be the highest used as yet in Europe, or 110,000 volts three-phase. Current is sent over the country to several large substations, some of which are laid out in order to supply the extensive metallurgical works belonging to the Lauchhammer Company. A. DE C.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, MAN., JANUARY 14.—The City of Edmonton, Alta., is considering the erection of a municipal power plant and with this end in view John S. Fielding, Toronto, Ont., has been asked to report on the various propositions in the vicinity of the city. After surveys he finds that power can be brought to the city from Grande Rapids at a cost of $29.63 per horsepower and the capital cost of the plant there and transmission line to the city would be $296,620. From Athabasca Landing the power would cost $20.15 per horsepower, while the plant to be erected there would cost $2,015,340. The City Council is taking the matter under advisement and a decision will be arrived at shortly, for Edmonton is determined to carry out its municipal ownership program, now owning its electric street railway, telephone, gas, waterworks and sewerage systems, as well as a municipal quarry.

A civic committee has been appointed in Vancouver, B. C., to look into the telephone question, the suggestion having been made that another system is necessary to relieve the congestion, and it has been proposed to install a municipal automatic system in opposition to that supplied by the British Columbia Telephone Company, about which complaints have been made.

The Western Canada Company is the name of an organization now being formed to develop electrical power in the vicinity of Rainy River and Fort Francis, in New Ontario. The charter which has already been presented to the authorities at Ottawa provides for the construction of a number of power canals. The work, as suggested by the preliminary application, is large.

Vessel owners on the Pacific Coast are hastening to comply with the recent regulation issued by the Department of Marine and Fisheries at Ottawa, making it necessary for each passenger steamer of 400 tons or over and each freighter of 1,200 tons to carry wireless telegraph instruments.

The British Columbia Telephone Company, with headquarters at Vancouver, B. C., has decided to build a steeamer for cable laying at a cost of $35,000, work on which will commence during the present month. The first work to be done by this steamer will be laying the new paper Pupin cable between Vancouver Island and the mainland.

The Winnipeg Electric Company, which operates gas, electric light, power and street railway companies in and around Winnipeg, has extensive plans for work to be undertaken this year in connection with its power plant at Lac du Bonnet, some sixty-five miles to the north of Winnipeg. Already a permit for a substation to cost $72,000 has been taken out and work on the structure will be started shortly. In addition the plans call for improvements to the plant to cost approximately $500,000. A year ago the company's power plant broke down, plunging Winnipeg in darkness, and the present improvements are to prevent a repetition of such an occurrence. Wilford Phillips, Winnipeg, Man., is general superintendent.

The British Columbia Telephone Company has plans for four new telephone exchanges to be erected this year at Duncans, Alberni, Nelson and Kamloops, and it is probable several others will be erected before the end of the year. The head office of the company is at Vancouver, B. C.

R. M. Horne-Payne, chairman of the British Columbia Electric Company, writing from the office of the Company at Vancouver, B. C., says: "We should be greatly obliged if you would state in your publication that the reports referring to the British Columbia Electric Railroad and the Western Canada Power Company, said to be combined, are without foundation. We have neither received, nor made, nor considered any agreement with the Western Canada Power Company and cannot understand how such a report could be circulated, much less confirmed."

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., JANUARY 14.—The City of Sherbrooke, Que., has awarded the contract for construction of the new dam and power house. When completed this new plant will double the present development, or will generate about 6,000 horsepower.

The Seymour Electric Company is offering power to the city of Kingston, Ont., at $25 per horsepower year. The City has joined with other eastern municipalities seeking cheap power from the Hydro-Electric Commission of Ontario.

The Aluminum Company of America has purchased 3,500 acres of land, including Bernhart's Island in the St. Lawrence River, below Prescott, Ont., and now proposes to install a plant capable of developing 300,000 horsepower. It is stated that, in the event of permission being received from the Dominion Government, the Company is prepared to spend $40,000,000 to perfect its scheme, which will mean the employment of about 10,000 men.

A number of Ontario capitalists, under the name of the Lake Erie & Northern Railway Company, will apply to the Dominion Parliament, at its present session, for a charter to build an electric radial line from the City of Brantford to Port Dover, in the province; to erect telephone and telegraph lines between the two points, and to construct wharves, grain elevators, etc., at Port Dover. It will also ask the right to generate electricity. The capital stock will be $1,500,000.

The Long Sault dam project is to figure in the present negotiations being held at Washington. It is learned that the general question of protection to the navigable waters is to form a subject of discussion by the Canadian ministers with the United States authorities, and a definite understanding is expected to be arrived at. Power concerns which seek to thus interfere with international waters are on the increase, and the need of joint action is becoming more and more apparent. The Long Sault Development Company now has before Congress a bill that aims to give the Company authority to construct a dam at the Long Sault Rapids, above Cornwall, Ont., from the Canadian to the American side. Of course authority to construct works on the Canadian part of the St. Lawrence River would have to come from the Parliament of the Dominion here, but the attitude of the Canadian house on the question was fully emphasized, last session, when the St. Lawrence Power bill was before it. While this bill sought only a transmission line from Brockville to Montreal, it was nevertheless regarded as an offshoot of the bigger proposition and in consequence was hedged about by many limitations.

A new use for electricity has been discovered by a well-known inventor in this city, whereby sleep is induced and pain entirely eliminated by application to the head of an individual of a wonderful little electric instrument. Dr. Mark G. McElhinney, of Ottawa, has constructed a machine, which he calls the "Telectron" and which puts patients to sleep by subjecting them to the influence of a softened effect of the Hertzian wave. The inventor expects that his device will displace chloroform, ether and all other anaesthetics in surgical operations, and will also find a place in the bed-chamber of victims of insomnia.

COMMISSION NEWS FROM NEW YORK.

Special Correspondence.

During the week of January 16, the following matters were considered by the New York State Public Service Commission, Second district:

The application of the Buffalo and Lackawanna Traction Company for approval of the use of the proceeds of bonds heretofore authorized allowing the use of $101,000 for acquiring cars and mofor equipment instead of for other purposes, as it was originally authorized.

The application of the Rochester Railway and Light Company for authority to issue mortgage bonds necessary to refund obligations amounting to $810,000.

The application of the Newburgh Light, Heat and Power Company for permission to exercise franchises in the village of Montgomery, Orange County.

A conference of general managers, division superintendents, chief train dispatchers and master mechanics of interurban electric railway companies under the jurisdiction of the Commission will be held to discuss methods of operation which will safeguard public travel over these lines.

The application of the Elmira Water, Light and Railroad Company was heard for authority to issue $336,000 in five-per-cent fifty-year bonds, also the application of the Lockport Light, Heat and Power Company for authority to issue $72,000 in thirty-year five-per-cent bonds.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

KALISPELL PLANT COMPLETED.—The hydroelectric plant of the Northern Idaho & Montana Power Company, which has been in the course of construction for the past eighteen months, is now completed. The installation will develop 4,000 horsepower.

THE EMPORIA, VA., PLANT.—The hydroelectric plant which is situated on the Meherrin River, near Emporia, was completed recently by the Emporia Hydroelectric Corporation and is now in operation. The plant at present is equipped to supply 1,000 kilowatts, but provisions have been made so that this can be increased to 3,000 kilowatts when this is desired. The dam which has been constructed is 700 feet in length and thirty-six feet in height. The flow of the river averages 400 second-feet for 270 days in the year.

A NEW WASHINGTON PLANT.—The Pacific Power Company of Tacoma, which has under construction at Dieringer, Wash., one of the largest hydroelectric power plants in the West, has placed an order with the Allis-Chalmers Company of Milwaukee, for two large hydraulic turbines. Each wheel will develop 2,400 horsepower. The turbines are to operate under a head of 480 feet of water, received from a storage basin, into which Lake Tapps, above Sumner, Wash., is being converted. The water is to be brought down through two specially-constructed steel pipe lines, each 2,200 feet long. The controlling valves, of the butterfly type will be over seven feet in diameter and the shafts which will carry the turbines will be nearly two feet in diameter. All parts which will be required to withstand water pressure will be tested under a pressure corresponding to a head of about 900 feet or about double what will actually be required at the Dieringer plant. The Pacific Power Company has been constructing a power plant on Lake Tapps above Sumner, for more than a year. The power house will be located on the floor of the Puyallup Valley at Dieringer, two miles above Sumner and only sixteen feet above the sea-level. In this respect, this plant will be unique among hydroelectric plants, for most such installations are located in the mountains close to some mountain stream. To maintain the head of water needed, the waters of the White River are being diverted and a dam now under construction will raise the present level of Lake Tapps. The steel pipes at the upper end will be eight feet in diameter, narrowing at the turbine wheels to four feet. The Lake Tapps project complete, will cost $3,500,000. The first units of the project are expected to be in operation some time during the summer of 1912. Construction work is being done by the Stone & Webster Engineering Corporation.

LIGHTING AND POWER.

(Special Correspondence.)

MINTO, N. D.—It is proposed to install a municipal electric light plant here. C.

NEW LISBON, WIS.—It has been voted to install a municipal electric light plant. C.

STILWELL, OKLA.—This city has voted electric light bonds to the amount of $5,000.

ADAIR, IOWA.—Bonds for $10,000 have been voted for the installation of an electric light plant. C.

TROY, MONT.—The county board has awarded a franchise for the installation of an electric light system. C.

IRENE, S. D.—A franchise has been granted to Jensen Brothers for the installation of an electric light plant. C.

HUDSON, WIS.—B. W. Ultman has purchased flowage rights and will construct a dam and power plant on the Kinnickinic River. C.

DULUTH, MINN.—The Great Northern Power Company will expend about $1,000,000 in improvements and extensions during the year. C.

KENYON, MINN.—M. T. Gunderson, owner of the electric light plant, is preparing to furnish all-day current for light and power purposes. C.

HENRY, S. D.—The Council has let a contract to the E. M. Pope Manufacturing Company for the installation of an electric light plant. C.

MELLEN, WIS.—The Appleyard interest of Ashland are building a large concrete dam and power plant at the rapids on Bad River. C.

HOOD RIVER, ORE.—The Oregon & Washington Electric Corporation has succeeded the Hood River Electric Light, Power & Water Company. P.

STANLEY, N. D.—A franchise for the installation of an electric light plant has been granted to J. I. Moore, of Minot, N. D. The cost is to be $8,700. C.

MILWAUKEE, WIS.—The finance comittee of the Common Council has set aside the amount of $300,000 in bond certificates for a municipal light plant. Z.

MONMOUTH, ILL.—Contract for the electrical equipment to be used in the new high school building was let to the Central Electrical Company of Chicago. Z.

EVELETH, MINN.—D. P. McIntyre, city clerk, desires correspondence with reference to the installation, during the year, of six blocks of ornamental lighting. C.

MANASSA, COLO.—The Manassa Milling & Electric Company has been incorporated with a capital of $50,000 by Samuel Jackson, Jr., Stephen A. Smith, and James H. Elledge.

MILWAUKEE, WIS.—The Milwaukee Electric Railway & Light Company has closed a contract to furnish power for the plant of the International Harvester Company. Z.

ROCHESTER, MINN.—An effort will be made to secure the construction in this city of the power plant of the Minneapolis, St. Paul, Rochester & Dubuque Traction Company.

VIRGINIA, MINN.—The board of education will install a private lighting system for the Roosevelt and new Technical High School Building at an estimated cost of $14,000. C.

BARABOO, WIS.—The Merchant's Power and Light Company, has been incorporated with a capital of $5,000. The incorporators are Geo. McArthur, G. O. McArthur and James Dickie.

FOWLER, COLO.—The Fowler City Council has introduced an ordinance granting to Messrs. Thatcher, Vail and Divine, a twenty-five year franchise for supplying electricity here.

GLOVERSVILLE, N. Y.—The committee which were appointed to investigate the practicability of establishing a municipal electric lighting plant has reported favorably on the proposition.

FORT WORTH, TEX.—The new electric light standards which have been installed here are of the decorative boulevard style. Each post carries four lamps surrounded by an opalescent globe.

ST. LOUIS, MO.—The Ozark Power and Water Company has been incorporated with a capital stock of $5,000. The incorporators are Chester E. Burg, R. W. Morrison and Frank Nottbusch.

ADAIR, IOWA.—At a special election the proposition to establish a municipal electric light plant carried by an almost unanimous vote. About $10,000 will be expended in the construction work.

CLEVELAND, OHIO.—The Beighlee Electric Company has been incorporated with a capital of $10,000. The incorporators are C. B. Ford, L. M. Diehl, W. T. Bishop and E. Earl Beighlee.

WEIMAR, TEX.—An ice, cold storage, waterworks and electric light company with a capital of $20,000 is being organized here. Over $12,000 of the stock has already been taken by local people.

WACO, TEX.—An election will be held February 14 to vote upon the question of issuing $250,000 bonds for the purpose of building and equipping an electric light plant to be owned by the City.

WHITEWOOD, S. D.—The Whitewood Electric Light and Power Company has commenced work on a pole line to Deadwood, to connect with the system of the Consolidated Power & Light Company. C.

CELINA, TEX.—The Celina Electric Light & Power Company has been incorporated with a capital stock of $5,000. The incorporators are S. W. I. Bryan, Ed A. Langford and V. L. Patrick. Z.

LEE'S SUMMIT, MO.—The Light, Power, Ice and Cold Storage Company has been incorporated with a capital stock of $20,000. The incorporators are Chas. M. Hauks, L. G. Morris and John H. Cook.

TOWER, MINN.—A vote will be taken in February on issuing bonds for $10,000 to $15,000 for the installation of a power plant at Pike River Falls to furnish power for a municipal lighting plant. C.

MARION, IND.—A franchise has been granted to the Marion Light & Heat Company to supply electricity for power purposes. The Company will erect new transmission lines throughout the city to supply motors. S.

LEBANON, IND.—The Citizens Electric Light Company has increased its capital by the sum of $50,000. The additional capital is to be used in enlarging the plant and installing additional machinery and equipment. S.

KENTON, O.—The Kenton Gas & Electric Company has agreed to build a new $65,000 plant if the city council will extend its franchise twenty-five years. If the franchise is granted the Company will float new bonds.

BALTIMORE, MD.—The North Baltimore Heat & Service Company has been incorporated with a capital of $30,000 to furnish heat and power. The incorporators are Ralph S. Hubbard, W. L. Holbrook, and Claude R. Banker.

AKRON, O.—The Northern Ohio Power Company has been incorporated with a capital of $10,000 to build hydroelectric plants. The incorporators are Will Christy, Chas. H. Lohr, Chas. Currie, C. F. Moore and N. O. Mather.

EAST ST. LOUIS, ILL.—An electric lighting plant is a part of the plans for a new hotel in East St. Louis to be built by Carl J. Vogel, of St. Louis, and for which Architect A. B. Frankel, of East St. Louis, has made sketches. Z.

MINOT, N. D.—H. M. Byllesby & Company, of Chicago, has purchased the plant of the Minot Electric Light Company, and took possession on January 20. The Byllesby Company purchased all the stock of the Minot Light & Telephone Company, which had a capital of $100,000.

UPPER SANDUSKY, O.—Negotiations are pending looking to the sale of the local electric light plant. A Providence, R. I., company, backed by New York capitalists, is said to hold an option, the deal to be finally consummated this month. H.

MUNCIE, IND.—The City Council has created the office of electrical inspector and has provided for an examination of all electrical workers and moving picture operators, requiring that they hold a license before doing electric work. S.

DUBUQUE, IOWA.—The Union Electric Company, of which L. D. Mathes is general manager, has promised to install a number of large candlepower lights about the harbor here, which has been designated as a free municipal skating rink. Z.

EARLVILLE, ILL.—The Earlville Electric Light & Ice Company has been incorporated with a capital stock of $25,000 to manufacture and sell electricity, ice, gas and steam heat. The incorporators are John A. Bupee, C. A. Frank, A. C. Sadler, George W. Mundie and Fred B. Keeler. Z.

WINCHESTER, IND.—The Citizens Electric Light Company has entered into a contract to furnish electricity to the town of Farmland eight miles distant. Thirty-eight street lights will be installed and a transmission line built from which farmers along the line will be served with current. S.

MADISON, IND.—The plant of the Madison Lighting Company in this city has been sold to Frank R. Grover and William Clancy, of Chicago, and Theodore Durst, of Waukegan, Ill. The plant here was purchased some years ago from local owners by a Chicago company, headed by John H. Brown.

RAPID CITY, S. D.—The Dakota Power Company has, through a recent purchase, absorbed the Rapid City Gas & Electric Light Company. Power will at first be furnished to several minng companies in the southern hills, and later the capacity of the plant is to be increased to 10,000 horsepower.

STERLING, ILL.—The Sterling Gas & Electric Light Company has asked the Fire and Water Committee of the City Council to select a type of boulevard lamp post, after which the company will install a sample with a view of leading to a complete system in the business section of the city. Z.

ERWIN, TENN.—Plans for the plant of the Nolachucky Power Corporation at Glass Rock include the installation of 8,000 kilowatts in hydroelectric generators. The dam will be 750 feet in length, 35 feet in height and have a bulkhead 100 feet long. The estimated cost of the plant is $434,000.

DEFIANCE, O.—This city has contracted with the Defiance Gas & Electric Company, to furnish light for ten years. Street lighting will be done at the rate of $70 a year per lamp, and commercial lighting at the rate of nine cents per kilowatt-hour, with a discount of one per cent for prompt payment. H.

MATOKA, ARK.—The Matoka Power Company has been incorporated to operate an electric plant and street railways. The capital stock is $25,000, and the incorporators are William DeL. Walbridge, Herbert R. Mackay, Henry B. Walbridge, of New York; John H. Parrott, of Roanoke, Va., and James C. Strass, of Matoka.

COMBINED LOCKS, WIS.—The contract has been awarded to the O'Keefe & Orbinson Engineering & Construction Company, of Appleton, Wis., by the Combined Locks Paper Company, for the construction of a steel and concrete dam, 645 feet long, to carry a head of nineteen feet of water. Cost $90,000 to $100,000. C.

SPRINGFIELD, ILL.—John H. McCreery has surrendered his franchise granted by the City to operate an electric-lighting plant, and the St. Nicholas, St. Nicholas Annex and Silas Hotels as well as many other business blocks will now be lighted and supplied with power by the Springfield Light, Heat & Power Company. Z.

NORTH BALTIMORE, O.—The North Baltimore Service Company has been incorporated with a capital stock of $30,000. The concern will make and sell electricity and gas for heat, light and power. The incorporators are: Arthur J. Darton, Ralph S. Holbrook, W. L. Holbrook, Joseph Steinem and Claude R. Banker.

KNIGHTSVILLE, IND.—The Town Board has under consideration the installation of equipment necessary for electric lighting of the town and for lighting of stores and dwellings. The current will be furnished by the Terre Haute, Indianapolis & Eastern Traction Company and a franchise will be granted the Company for that purpose. S.

PALMYRA, N. Y.—This city is now lighted by power supplied from the Newark electric plant, over the new nine-mile transmission line which has recently been constructed by the Wayne County Gas and Electric Company, between the two villages. Lighting and power service will also be supplied to Port Gibson from the transmission lines.

MUNCIE, IND.—Steps are being taken by the City Council for the installation of a new globe street-lighting system. The city electrical inspector has been instructed to secure information concerning the new globe-post lighting system which is declared to be more attractive and satisfactory and at a little more cost than the present arc lights. S.

MINNEAPOLIS, MINN.—The Minneapolis General Electric

Company is planning the installation of a steam turbine instead of the old engine system in the new plant, it is proposed to install on the site of the old power house. The construction will be of steel, brick and concrete. The company is also planning the erection of a series of sub-stations. C.

BLUFFTON, IND.—Contracts have been awarded to the Flemming & Harrisburg Company of Harrisburg, Pa., to install a 450-horsepower engine and other equipment in the city lighting plant. A dynamo to be attached to the engine will be furnished by the Ft. Wayne Electric Works. The city will rent the equipment for two years with option for purchase at the expiration of that period. S.

SOUTH BEND, IND.—The report of the city electrician for the year 1910 shows that he issued 1,066 permits for the wiring of buildings, an increase of 350 permits over the previous year. Motors of total horsepower of 995 were installed for the use of the city and 1,120 wiring contracts were approved. A number of police and fire-alarm boxes were placed and the record of the year is regarded a good one. S.

DALTON, GA.—The new waterworks system and electric light plant at this place will be in operation by July 1. $50,000 is being spent in additions to these plants, and they will be placed under the same roof. The addition to the electric light plant will give the city a commercial lighting plant, and power will be furnished a number of small manufactories. When the additions are completed, Dalton will have a $35,000 electric light system. I.

INDIANAPOLIS, IND.—The Southern Indiana Power Company, with a capital stock of $800,000, has been incorporated by T. N. Stillwell, F. E. Matson, W. J. Henley, E. E. Gates and Gustave H. Mueller, all of Indianapolis, as directors. The object of the company is to construct power stations in the Indiana coal fields for the purpose of supplying light, heat and power. The first station, it is planned, will be at or near Bedford, Ind. Z.

BIRMINGHAM, ALA.—The Water and Lights and Telephones Committee of the City Council has recommended in their report that the Mayor, the chairman of the Water Committee, chairman of the Lights and Telephone Committee and Alderman Thorpe be authorized to have installed at once necessary equipment to increase the efficiency of the North Birmingham Light Plant. The committee also recommended the installation of a number of arc lights at various localities in the city. I.

OKLAHOMA CITY, OKLA.—The Western Power and Irrigation Company, which has recently increased its capital to $500,000, has begun the actual work of developing Oklahoma's water power. The dams will be constructed by the Ambursen Hydraulic Construction Company under the supervision of W. L. Church, of Boston. The installation of the electrical machinery and apparatus will be in charge of W. F. Barnes, state representative of the Westinghouse Company.

MEDFORD, ORE.—The Rogue River Electric Company, with headquarters at Medford, will start work on its new plant at Prospect early in the spring. The plant will be one of the finest and largest of its kind in the West, and it is estimated that over 75,000 horsepower can be taken from the waters of the Rogue River at Prospect. Power will be transmitted to cities in the valley at 60,000 volts. The plant at Gold Ray, ten miles from Medford, has been found inadequate to supply the needs of these towns.

LEBANON, IND.—The Citizens' Electric Light Company's plant in this city has been sold by R. A. Edwards and G. R. Chamberlain, of Peru, to the Seymour Public Service Company, of Seymour. C. E. Layton becomes the secretary and treasurer of the company and will assume the management of the plant. The directors are T. C. McReynolds, W. W. Layton, C. W. McReynolds, T. A. Scott and C. E. Layton. The Company has the contract for the municipal lighting and is furnishing light and power for domestic use and power

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company has bought valuable and extensive water-power rights on the St. Croix and Mississippi Rivers, which will be developed as rapidly as needed. Included in the holdings are riparian rights and dam sites on the properties several miles above St. Croix Falls near Otsego and in the villages of Clearwater and Monticello, together with the power now developed at Taylor's Falls and Minenapolis. At St. Croix Falls will be built a duplicate plant of the one at Taylor's Falls, which has a capacity of 25,000 horsepower. Z.

OAKLAND, CAL.—The United Properties Company of California, which was recently incorporated under the laws of Delaware is the largest concern ever organized under the laws of that state. This company has a capital of $200,000,000, and is authorized to equip, construct and operate railroads, steamship lines, electric light, power and traction lines, water for domestic purposes and irrigation, and to build and operate wharves, docks and warehouses. The Company was chartered for the purpose of effecting a merger of all the public utilities companies of Oakland and Berkeley, Cal., including the ferry line that connects these places with San Francisco. The directors, who are from New York, San Francisco, and Oakland, are F. M. Smith, W. S. Thevis, R. G. Hanford, Gavin, McNab, C. B. Zabriskie, W. R. Alberger, Denis Searles and Harry W Davis.

ELECTRIC RAILWAYS.

(Special Correspondence.)

OKLAHOMA CITY, OKLA.—The Oklahoma Street Railway Company will double the capacity of its power plant.

ST. PAUL, MINN.—The St. Paul Railway Promotion Company is planning the extension of its line to Winona and La Crosse. C.

MASON CITY, IOWA.—The City Council is planning the construction of a municipal railroad from the city limits to the pumping station. C.

WORTHINGTON, MINN.—Knight & Doyle are planning the construction of an electric line to Albert Lea, construction to be started during next summer. C.

IOWA CITY, IOWA.—The Iowa City-Cedar Rapids Interurban Railway Company is planning the expenditure during the year of $80,000 for the improvement of its system. C.

MADISON, WIS.—The Chicago & Wisconsin Valley Railway will commence work April 1 on the construction of its line to Portage. The survey will also be started soon for an extension to Stevens Point. C.

MOROCCO, IND.—The election in Lincoln township, Newton County, to rate a subsidy tax in aid of the construction of the Indiana Northwestern Traction line from Monticello to Hammond was carried. Only nine votes were cast against the subsidy. S.

IOWA CITY, IOWA.—The Iowa City-Cedar Rapids Interurban Company is planning to expend $80,000 for improvements the coming year, which will include a new sub-station at Iowa City, the removal of the Coralville sub-station to North Liberty and considerable ballasting. Z.

RICHMOND, IND.—The City authorities are threatening to annul the charter of the Terre Haute, Indianapolis & Eastern Traction Company because of neglect to make certain improvement in the city system, and because of neglect to remove its freight tracks from Glen Miller Park. S.

PEKIN, ILL.—Plans for the organization of the Pekin & Petersburg Interurban Railway Company as announced at a meeting call for a first mortgage for $50,000 to be given subscribers for bonds, this to be followed by another bond issue for $50,000 in the form of debenture bonds. Z.

CANTON, ILL.—Stockholders of the Illinois Central Railway Company at the annual meeting approved the president's recommendation that the road be extended this year to Farmington. Directors re-elected were as follows: J. V. Brokaw, Sylvester Furrey, J. W. Gaddis, T. B. Bass and G. W. Chandler. Z.

GRIFFIN, GA.—The Griffin City and Suburban Railway Company has made application to the State Railroad Commission for authority to issue stocks and bonds with which to finance its plans for the construction of a street railway for that city. The petitioning company was represented by Joseph D. Boyd and Frank Flynt, both lawyers of Griffin. I.

SOUTH BEND, IND.—The interurban line that has been graded between this city and Plymouth will be completed by an early resumption of tracklaying. The work will be completed by W. R. Pepper, the Kentucky contractor. The Murdock Syndicate is back of the road which is to form a link in the interurban road from South Bend to Logansport. S.

HOUSTON, TEX.—The causeway of the Galveston-Houston Interurban Railway Company will, it is reported, be ready for use not later than June 1. The local officials have been advised that the entire shipment of structural steel which will compose the superstructure of the Interurban powerhouse on Clear Creek had left New York. The concrete foundation of the powerhouse is ready for the placing of the steel.

UVALDE, TEX.—Officers were elected by the directors of the Uvalde & Leona Interurban Railroad Company as follows: President, Charles Peterson, San Antonia; first vice-president, A. M. Avant, Uvalde; second vice-president, M., M. McFarland, Uvalde; third vice-president, F. A. Piper, San Antonio; fourth vice-president, J. G. Smyth, Uvalde; treasurer, W. D. Kincaid and secretary, F. J. Rheiner, Uvalde. Z.

FOSTORIA, O.—At the annual meeting of stockholders of the Fostoria & Fremont Railway Company, held on January 9, the following officers were selected: President, F. D. Carpenter; vice-president, J. H. Goeke; secretary and treasurer, J. D. McDonel. These, with J. H. Goeke, F. W. Cohen, G. H. McDonel and J. W. McDonel, constitute the directorate. Reports show that the work of building the line from Fremont to this city is well under way, and that the substation at Burgoon has been started and all equipment has been purchased H.

AUSTIN, TEX.—The Austin Street Railway Company which has been chartered by the Secretary of State with a capital stock of $1,250,000 is a part of the re-organization plan of the Austin Electric Railway Company which sold its holdings outright to the new corporation. R. C. Storey of Boston, Mass., comes to join O. G. Fuller of Milwaukee and F. H. Watress of New York who were interested in the old system. W. J. Jones has been retained as general manager. The incorporators are William G. Bell and W. H. Folts of Austin and R. C. Storey.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

LORETTO, NEB.—The Akron-Loretto Telephone Company has been incorporated with a capital of $3,500. P.

DONNELLY, MINN.—The farmers who have telephones are planning to incorporate with a view to improving the service. C.

GANN VALLEY, S. D.—The directors of the telephone company are considering the construction of an exchange building. C.

CORCORAN, CAL.—The Alpaugh Telephone and Telegraph Company has been incorporated here with a capital stock of $5,000. A.

NAPERVILLE, ILL.—The Inter-State Telephone Company is rebuilding its local plant, laying its wires in the conduits recently installed. Z.

SAUK RAPIDS, MINN.—The Northwestern Telephone Exchange Company is stringing cables and putting in a number of new poles. C.

ABERDEEN, WASH.—The Pacific Telephone & Telegraph Company will expend $50,000 on the erection of a new block on Market Street. C.

HETTINGER, N. D.—A franchise has been granted to the Hettinger & Cedar River Telephone Company to maintain telephone service in the county. C.

SIOUX CITY, IOWA.—The Sioux City Telephone Company announces that $100,000 will be expended during the year in improvements, work on which will be started shortly. C.

FAYETTE, IOWA.—The Stony Hill Telephone Company, has been incorporated with a capital of $10,000. The incorporators are Dan Brause, E. C. Margraff, David Saltsgiver.

CADILLAC, MICH.—The Armstrong Telephone Company, has been organized here with T. C. Colley, president; C. R. Huffman, vice-president, Floyd Ayers secretary and treasurer.

ORCHARD FARM, MO.—The Orchard Farm Telephone Company has been incorporated with a capital stock of $1,950. The incorporators are Gustave Kipp, William Schnedler and Ernest Nolte. Z.

SHELBYVILLE, ILL.—Stockholders of the Queen City and Shelby County Telephone Company will hold a meeting February 6 to vote upon a proposition to consolidate with the Shelby County Telephone Company. Z.

NAPOLEON, O.—The receiver of the Napoleon Home Telephone Company has given notice that beginning with the first of the year all discriminations in rates will be eliminated. Preachers, priests, railroads, former directors, and other preferred patrons will, from this time, be charged the uniform rate. H.

INDIANAPOLIS, IND.—The stock of the New Telephone Company is in brisk demand, with little on the market. The Company's earnings have shown a steady increase which is responsible for much of the activity of the stock. The rumor has been revived that the two local companies will ultimately combine. S.

TOLEDO, O.—At the annual meeting of the stockholders of the Toledo Home Telephone Company R. E. Hamlin, vice-president and treasurer, tendered his resignation to take effect on February 1. The vacancy was filled by the selection of Charles G. Cunningham, an attorney, who represents the Morgan-Bell interests here. The annual report shows that there are now in service 14,951 telephones, and that during the year just passed the Company has expended $83,179.12 on new construction work. H.

ELECTRICAL SECURITIES.

There has been a continuing advance in prices and it is predicted that this will hold, as money is easier both in this country and abroad. Reading, United States Steel and Union Pacific were most active, and made more than half of the total shares dealt in. Apparently the only thing holding trade in restraint is the uncertainty as to the pending decisions affecting railway and industrial corporations. Confidence, however, is growing and it is thought that there will be nothing in these decisions to paralyze enterprise. This feeling is reflected in the increasing investment absorption of bonds, which usually is the forerunner of a broader demand for stocks.

The annual meeting of the New York Edison Company will be held February 14.

The Kings County Electric Light & Power Company, of Brooklyn, will hold its annual meeting February 27.

At the annual meeting of the Chicago & Oak Park Elevated Railway Company retiring directors were re-elected.

Peabody, Houghteling & Company, of Chicago, have sold to a London syndicate $1,000,000 first mortgage six per cent serial gold bonds of the Minnesota & Ontario Power Company.

P. W. Brooks, of New York, is offering the balance of $700,000 Kankakee Gas and Electric Company first and refunding sinking fives due 1930. The company supplies Kankakee and three adjacent towns. The bonds are a first lien on the properties, subject to a small underlying mortgage, and are offered at ninety-five, to net about 5.42 per cent.

Pingree, McKinney & Company, Boston, are offering $500,000 Mohawk Hydro-Electric Company first mortgage six per cent bonds, due 1940. The bonds are a first mortgage on all property, rights, etc., which represent a large equity in excess of bonded debt, and are issued under permission of the New York Public Service Commission. The bankers call attention to the management of the company in the hands of William Barclay Parsons, president, and the fact that the interest on the bonds is assured by guaranteed minimum earnings under one contract for less than one-half capacity of plant. The bonds are offered at 101½, netting approximately five and seven-eighths per cent.

DIVIDENDS.

Connecticut Railway & Light Company; quarterly common dividend of one per cent and preferred dividend of one per cent, both payable February 15.

Electric Bond & Share Company; the usual quarterly dividends of 1 and one-quarter per cent on its preferred stock and two per cent on its common stock; the preferred dividend payable February 1; the common dividend payable January 16.

Guanajuato Power & Electric Company; quarterly preferred dividend of two per cent, payable February 1.

Havana Electric Company; dividends of one and one-half per cent on both common and preferred stocks, payable February 11.

Kellogg Switchboard & Supply Company; regular quarterly dividend of two per cent, payable February 1.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	Jan. 16.	Jan. 9.
Allis-Chalmers common	8	8
Allis-Chalmers preferred	28¼	29
Amalgamated Copper	64¼	65⅛
American Telegraph & Cable	82	83
American Telegraph & Telephone	142⅝	141⅝
Brooklyn Rapid Transit	76¼	75¾
General Electric	150½	151½
Interborough-Metropolitan common	19¼	19⅞
Interborough-Metropolitan preferred	54	54⅞
Kings County Electric	123	123
Mackay Companies (Postal Telegraph and Cables) common	92¼	92
Macakay Companies (Postal Telegraph and Cables) preferred	74¾	74¾
Manhattan Elevated	138	140
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	103	103
Pacific Telephone & Telegraph	46	45
United States Steel common	76½	74⅛
United States Steel preferred	118½	118⅛
Western Union	74½	75
Westinghouse common	66½	64
Westinghouse preferred	110	100

BOSTON.

	Jan. 16.	Jan. 9.
American Tel. & Tel.	142½	141½
Edison Elec. Illuminating	288	280
General Electric	150½	151½
Massachusetts Electric common	17	18
Massachusetts Electric preferred	84¼	84¼
New England Telephone	137	138
Western Tel. & Tel. common	16	17
Western Tel. & Tel. preferred	91	91

PHILADELPHIA.

	Jan. 16.	Jan. 9.
American Railways	43	42
Electric Company of America	12¼	11⅝
Electric Storage Battery common	50	49½
Electric Storage Battery preferred	50	49½
Philadelphia Electric	16¼	16⅜
Philadelphia Rapid Transit	19⅞	19¼
Philadelphia Traction	85	84
Union Traction	45⅝	44¾

CHICAGO.

	Jan. 16.	Jan. 9.
Chicago Railways, Series 1	96	95
Chicago Railways, Series 2	24½	24
Chicago Subway	4½	4½
Chicago Telephone	120	120
Commonwealth Edison	113	113½
Metropolitan Elevated common	20	21
Metropolitan Elevated preferred	68	68
National Carbon common	117	117
National Carbon preferred	115	115

PERSONAL MENTION.

A. H. WHITESIDE has resigned as manager of the power and electrical department of the Allis-Chalmers Company.

H. MUNN SLAUSON, sales manager of the Opalux Company, New York, N. Y., is in Chicago attending the Electrical Show at the Coliseum. Mr. Slauson's visit is of a business nature.

H. B. LOGAN, president of Dossert & Company, of 242 West Forty-first Street, New York, N. Y., is in Chicago this week visiting the Chicago representative of his company and also attending the Electrical Show.

WALTER H. WHITESIDE, formerly president of the Allis-Chalmers Company, is sailing today on the *Coronia* for Europe. He will make a tour of several months through Spain, Italy, Egypt and the near-East.

J. E. ERICKSON, sales manager of Thomas G. Grier & Company, Chicago, Ill., has returned to Chicago after an extended visit in the East. On his recent trip Mr. Erickson visited the company's

factory at Boston, Mass., and also spent a good deal of time at his home in that city.

A. E. KENNELLY delivered a lecture before the Pennsylvania Chapter of the Society of Sigma Xi at Philadelphia, on January 13. The subject was "Wireless Telegraphy and Telephony as Compared with Wire Telegraphy and Telephony."

H. U. WALLACE, of Chicago, has been made vice-president of the Fort Dodge, Des Moines & Southern Interurban Company. Mr. Wallace is a son of John F. Wallace, former engineer of the Panama Canal under President Roosevelt's administration.

WM. H. WALKER and two of his assistants were burned by an explosion in their research laboratory at the Massachusetts Institute of Technology on January 4. Although severe, the burns are not serious, and will not permanently cripple or disfigure either Dr. Walker or his assistants.

V. L. CRAWFORD has been appointed Eastern representative of W. N. Matthews & Brother, with headquarters at 227 Fulton Street, New York City. Mr. Crawford has been connected with this company for a number of years as a traveling representative and he is one of the most popular and energetic men in the industry.

N. M. ARGABRITE, manager of the public service operating company, of Belvidere, Ill., has resigned his position with this company to enter the service of the American Gas & Electric Company, of New York City. T. C. McKeen, who has filled the position of assistant manager under Mr. Argabrite, will succeed to the position of manager at Belvidere.

LEWIS S. CURT, of the export department of the Federal Electric Company, was appointed a member of the foreign trade committee of the Chicago Association of Commerce, at a recent meeting of the board of directors. This committee is organized for the purpose of increasing the commerce of Chicago with foreign markets. Mr. Curt's experience in the Spanish-American export trade will make him a valuable member of this committee.

ALBERT SCHEIBLE has opened an office at 125 LaSalle Street, Chicago, as research engineer, making a specialty of helping manufacturers and investors to solve problems involving inventions. Mr. Scheible's twenty years' experience in overcoming patent difficulties and in evolving commercial devices for a large variety of electrical and mechanical devices, together with an unusual acquaintance with the historical development of electrical appliances, are thus placed at the disposal of a wider clientage.

DAVID HARLOWE, now traffic manager of the Allis-Chalmers Company, of Milwaukee, has been appointed to the Wisconsin Railroad Commission to fill the place of Prof. B. H. Meyer, who resigned. Mr. Harlowe has been connected with the Allis-Chalmers Company for over twenty-five years, becoming traffic manager of the old E. P. Allis Company in 1893. Previous to this he was chief clerk to Dwight W. Keyes, general freight agent of the Chicago, Milwaukee & St. Paul Railroad. Mr. Harlowe was offered a place on the Commission several years ago, but declined to serve at that time.

EDWIN R. WEEKS, of Kansas City, Mo., one of the well-known electric-light men and a pioneer in development of this phase of the industry, has been honored, as president of the Humane Society of Kansas City, by a tribute in connection with the erection of the Faxon sanitary fountain for horses. Mr. Weeks is the designer of this fountain. Accompanying the report is a fine portrait of Mr. Weeks and several photographs illustrating incidents in connection with the dedication. Mr. Weeks has for a long time devoted himself to this humane cause and his benefactions are greatly appreciated by the community of which he is so valued a member.

D. W. CALL, the new president of Allis-Chalmers Company, although coming to Milwaukee direct from New York City, has always considered the Middle West as his home. He was born on a farm near Cleveland, O., and is of Scotch descent. At the age of seventeen he commenced his business career in Cleveland, and for twenty-three years has been engaged in active business life in connection with large manufacturing corporations. For the past six years Mr. Call has been assistant to the president of the American Steel Foundries Company, with his headquarters in New York City. He has also had to do with other large companies both in this country and the Dominion of Canada.

OBITUARY.

E. L. GREENLIEF, president of the Illinois Telephone Company, died January 10 at his home in Jacksonville, aged seventy-two years. He was prominent in Central Illinois industries and financial institutions.

CHARLES HILL MORGAN, who has for many years been prominent in the steel industry of the United States, died on January 10, at the age of eighty years, at his home in Worcester, Mass. His death was not unexpected, as his health had for some time been failing. Mr. Morgan was one of the founders of the Worcester Polytechnic Institute and was a former president of the American Society of Mechanical Engineers. He was also an honorary member of the Society of Civil Engineers of France. Mr. Morgan is survived by a widow and five children.

NEW PUBLICATIONS.

ELECTRIC JOURNALS COMBINE.—With the January issue the *Electric Age*, which for more than a quarter of a century has been published in New York, is combined with the *Southern Electrician* of Atlanta, Ga. The combined papers under the old name *Southern Electrician* will continue to be published from the Atlanta office.

VENTILATION IN ITS RELATION TO HEALTH.—Warren Webster & Company, Camden, N. J., have reprinted in pamphlet form the paper entitled "Ventilation in Its Relation to Health," read by the company's chief engineer, William G. Snow, at Cornell University, in the course on sanitary science and public health in co-operation with the New York State Department of Health. The Company will be pleased to send the pamphlet on request.

TRACTION PAPERS COMBINE.—Announcement has recently been made of the consolidation of the *Electric Trunk Line Age* and the *Railway Electrical Engineer*, the official journal of the Association of Railway Electrical Engineers. The journal in its enlarged form continues to be the official organ of that organization. C. L. de Muralt of the firm of Muralt & Company, engineers, and professor of electrical engineering at the University of Michigan, has been retained as editor. He was formerly editor of the *Electric Trunk Line Age*, and is a recognized authority on electric traction problems, both in this country and in Europe. He is particularly well known in connection with the electrification of the Swiss mountain railways and the Alberg tunnel in Austria, and he has also done work in this country for the Erie Railroad, and on the Detroit River Tunnel electrification.

NAVY DEPARTMENT REPORTS.—The Navy Yearbook for 1910 and the annual reports of the Secretary, the Judge-Advocate-General, the Surgeon General, the Paymaster General, the Commandant of the Marine Corps, the Bureau of Steam Engineering and the Bureau of Equipment have appeared. The latter states that the bureau has continued to devote special attention to the simplification of wiring, lighting, and appliances, with a view to reducing weight while maintaining efficiency. Changes in specifications for wire supplies have been made, with a view of obtaining an insulation of greater heat-resisting qualities. Extensive tests with electric baking and cooking appliances have been carried on, with the result of demonstrating the superiority in many respects of electric ranges and bake ovens over the ordinary type using coal and provision has been made for installing them on battleships and submarines now building. Steam heaters are also being replaced by electric heaters on some large vessels. The experience obtained with turbo-generating sets has confirmed the intention not to purchase reciprocating engines for this purpose, except in special cases. The first turret danger-zone signal instruments were preliminarily tested, with satisfactory results. Statements as to electric lamps and wireless apparatus and stations are given on other pages of this issue.

NEW INCORPORATIONS.

SPRINGFIELD, ILL.—The Wi-Ko Electric Company, of Chicago, has been incorporated with a capital stock of $25,000 to manufacture and deal in electrical articles and contrivances. The incorporators of the Company are Robert Witz, Samuel Kerf and Charles W. Ercher. Z.

CHICAGO, ILL.—The Vesta Electric & Supply Company, of Chicago, has been incorporated with capital stock of $2,500 to manufacture and deal in electricity, heat, light, power and energy. The incorporators are Ward S. Perry, Jens Nielsen and Henry O. Krausel. Z.

BUFFALO, N. Y.—The Hancock-Howell Electrical Engineering Company, of Buffalo, N. Y., has incorporated to do a general electrical contracting business. The capital stock is $5,000, and the directors are Wheeler W. Hancock, Herbert H. Howell and George C. Hillman, all of Buffalo.

NORTH AURORA, ILL.—The Bentley-Snyder Company has been incorporated with a capital stock of $75,000 to manufacture and deal in, among other things, electricity and electric furnace products. The incorporators are Wilton Bentley, Frederick T. Snyder and James V. Cunningham. Z.

CHICAGO, ILL.—The Wallace Manufacturing Company has been incorporated with capital stock of $2,500 to manufacture and deal in electric and gas fixtures and other merchandise. The incorporators are G. Wallace, M. Moll, Albert W. J. Johnson, Bertha Johnson and Johanna C. Moll. Z.

FT. WAYNE, IND.—The Railway Ad. Bulletin Company has been incorporated, capitalized at $10,000. The company will manufacture advertising devices and electrical advertising cabinets for use in interurban railway stations. The directors are William C. Millett, Mark E. Bates and Thos. J. O'Dowd. S.

TOLEDO, O.—The Electrical Appliance Company of Toledo has been incorporated with a capital stock of $10,000. It will handle and sell all kinds of electrical appliances. The incorporators of record are: Mark Knabenshue, M. V. Girkins, Wesley S. Thurstin, George E. Seney, and Frances E. Smith. The business will be under the management of Mark Knabenshue. H.

PROPOSALS.

POST OFFICE, HOBOKEN, N. Y.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until February 6, for an electric push button mail lift in the United States post office, Hoboken, N. J., in accordance with the drawings and specifications, copies of which may be obtained at the Supervising Architect's office.

POST OFFICE, WABASH, IND.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until February 18 for the construction, complete (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the United State post office at Wabash, Ind., in accordance with drawings and specification, copies of which may be obtained from the custodian of site or at the Supervising Architect's office.

POST OFFICE, BARRE, VT.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until February 14, for the construction, complete, (including plumbing, gas piping, heating apparatus electric conduits and wiring), of the United States post office at Barre, Vt., in accordance with the drawings and specifications, copies of which may be obtained from the custodian of site, or at the Supervising Architect's office.

POST OFFICE, MILLEDGEVILLE, GA.—The office of the Supervising Architect, Washington, D. C., will receive sealed bids until February 8 for the construction, complete, (including plumbing, gas piping, heating apparatus, electric conduits and wiring), of the United States post office at Milledgeville, Ga., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Milledgeville, Ga., or at the Supervising Architect's office.

NAVY DEPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

Date of Opening.	Material.	Quantity.	Place of Delivery.	Schedule No.
Jan. 31—	Bells and buzzers, nonwater-tight	195	Brooklyn, N. Y.	3261
	Cells, dry	400	Brooklyn, N. Y.	3261
	Insulators, electrose	150	Brooklyn, N. Y.	3261
	Irons, soldering, electric	22	Boston, Mass.	3261
	Irons, soldering, electric	15	Brooklyn, N. Y.	3261
	Motor, induction	1	Brooklyn, N. Y.	3268
	Motors	3	Annapolis, Md.	3259
	Supplies, electrical	Miscellaneous.	Boston, Mass.	3261
	Tape, insulating, rubber	300 pounds	Boston, Mass.	3261
	Tape, insulating, rubber	400 pounds	Brooklyn, N. Y.	3261

INDUSTRIAL ITEMS.

THE GENERAL VEHICLE COMPANY, Long Island City, N. Y., gives some interesting notes regarding the advance of the electric vehicle, in its December issue of *Elec-Tricks*.

WICKES BROTHERS, Saginaw, Mich., have issued the January monthly stock list of machinery bargains. The list includes boilers, engines, pumps, machine tools, electrical machinery, etc.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn., lists in the January number of *Trumbull Cheer* a line of alternating-current motor-starting switches and baby knife switches. The number contains the usual amount of interesting reading and valuable hints to salesmen.

COLUMBIA METAL BOX COMPANY, New York, N. Y., announces that it has moved into its new factory building at 226-228 East One Hundred and Forty-fourth Street. The constantly growing demands forced the Company to more than double its equipment.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has received an order from the Knickerbocker Portland Cement Company, Hudson, N. Y., for an equipment of electrical machinery, among which are two 2,000-kilowatt turbine generators, one seventy-five-kilowatt direct-current turbine generator and a number of motors.

THE HUGHES ELECTRIC HEATING COMPANY, Chicago, Ill., is enclosing with a recent bulletin copies of several letters which it received from central stations that have bought and installed the No. 30 Hughes electric range. These letters are of interest to those who wish to investigate the cooking devices of this kind.

H. W. JOHNS-MANVILLE COMPANY, Cleveland, O., shows illustrations, in its January issue of *The J. M. Roofing Salesman*, of a number of Dayton, O., buildings roofed with J. M. asbestos. The back cover of the publication carries an illustration of the factory of the Wright Brothers, which is roofed with J. M. asbestos roofing and asbestoside.

THE COYNE NATIONAL TRADE SCHOOL, Chicago, Ill., announces that its address has been changed from 840-848 North Ashland Avenue to 78 Illinois Street, where it occupies a new building, erected to meet its increasing demands. In a booklet recently published by the school, its activities and aims are explained and a number of illustrations give an excellent idea of the work that is being done. The school has an extensive and well-equipped electrical department.

MACHADO & ROLLER, Pittsburg, Pa., announce that G. L. Crosby, formerly manager of Crosby, Craft & Company, is now their district sales manager. The lines handled by Machado & Roller include Roller-Smith electric instruments and circuit breakers, Columbia watt-hour meters and Hartmann & Bruan resonance frequency meters and tachometers.

THE MONITOR CONTROLLER COMPANY is the name under which the Monitor Sales Department, of Baltimore, Md., will be known after February 1. Under the new name a catalog has been sent out describing automatic controllers and starters for direct-current and alternating-current motors. The different types are illustrated and price lists are given throughout.

THE BRISTOL COMPANY, Chicago, Ill., has distributed copies of Bulletin No. 152, which is a general catalog of all the different sizes of Bristol's patent steel belt lacing. Attention is especially directed to pictures comparing the original No. 1 style of Bristol's patent steel belt lacing and the No. 12 style, which is shown ready to apply, and actually applied, to sections of belts.

ALLGEMEINE ELEKTRICITATS-GESELLSCHAFT, Berlin, Germany, has issued a circular describing a precision wattmeter for direct and alternating currents, which is now being manufactured by them. This instrument is an electro-dynamometer and is said to be accurate to 0.1 per cent. They are made for current strengths up to 200 amperes. For voltages above 600 volts, the multiplying resistance is mounted in a separate case.

THE MICHEL-KURZE COMPANY, New York, N. Y., has been organized to do photograph retouching and illustrating of machinery subjects. Offices have been established in the Hudson Terminal Building. The business will be managed by A. Eugene Michel and the staff of artists will be in charge of W. F. Kurze. Both Mr. Michel and Mr. Kurze are well known in the electrical industry as specialists in advertising engineering.

THE FEDERAL ELECTRIC COMPANY, Chicago, Ill., is enclosing with the January issue of *The Federalist* an address made by James M. Gilchrist before the Federal Sign System (Electric) Convention of Managers, which was held at Highland Park, Ill., in August. The address discusses briefly the various articles made by the Company. The issue of *The Federalist* contains a short description of the equipment of the new West Point gymnasium and the barracks at West Point.

THE TRIUMPH ELECTRIC COMPANY, of Cincinnati, O., has recently opened a sales office at 728 Poydras St., New Orleans. This is the sixteenth sales office now being maintained by this company, and is the third to be opened during the past year. The Triumph Company, in its new factory is doing a big business, and anticipates even greater returns during the coming year. A large stock of standard machines will be carried at the New Orleans office for immediate shipment.

EDGAR ALLEN & COMPANY, LTD., Imperial Steel Works, Sheffield, England, whose chief American office and warehouse is at 434 West Randolph Street, Chicago, announce that agency arrangements have just been completed with the firms noted below, at whose warehouses large and comprehensive stocks of Allen's high speed and carbon tool steels will be carried: Roehm & Davison, Detroit, Mich.; J. L. Osgood, Erie County Bank Bldg., Buffalo, N. Y.; John J. Greer & Company, 207 West Pratt street, Baltimore, Md.

THE ROCKWOOD MANUFACTURING COMPANY, Indianapolis, Ind., has issued a revised catalog which shows the improvements and changes that have lately been made in the Company's products. From a glance through this catalog an excellent idea may be otbained of the product put on the market by this company, and the uses to which friction transmission is put. Notes and formulae for the convenience of those wishing to install new drives, are included. The catalog is well printed and attractively illustrated.

THE ANDREW H. HOAG COMPANY, manufacturer of gas and electric fixtures, announces the removal of its headquarters from 46 West Broadway to 251 West Nineteenth Street, New York City. For the past few years the Company has operated two factories, with headquarters for both at 46 West Broadway. It is now announced that owing to the Company's rapidly increasing business this is no longer desirable, and that the factory, salesroom and offices will hereafter all be located at the new quarters, which is accessible to all the New York stores and up-town hotels.

THE WESTERN ELECTRIC COMPANY has just prepared for distribution an attractive 1911 wall calendar. The calendar, which has been finished in two colors, is of a pleasing design, and while the figures are large enough to be seen across the room, it is not too large for the office wall. The Western Electric Company's symbol, the familiar map of the United States within a circle, comprises the upper part of the calendar. The symbol represents the scope of activity of this Company. A separate legend is provided for each of the twelve months, illustrating some phase of the Company's manufacturing and selling program. Four illustrations, showing the arc lamp, ventilating fan and power motor, and the

Western Electric inter-phone, as typifying the "essentials of modern business"—light, ventilation, power and communication—also are prominently featured.

THE DEARBORN DRUG & CHEMICAL WORKS, which has distributed its feed water treatment and lubricants through an agency in the Philippines for the past two years, has decided to open its own branch offices and warehouse in Manila, P. I., and F. O. Smolt, who has been connected with mining propositions since his graduation in chemistry from the University of Illinois in the class of 1891, has become connected with the Dearborn Company, and sailed on January 7th for Manila, to take charge of this work, under the supervision of E. C. Brown, manager of the foreign department of the Dearborn Company. Mr. Brown has spent most of the past two years in Japan, China and the Philippines, investigating steam plant and railroad conditions in the interests of Dearborn products, and is still there, having made selling connections at Tokyo, Tientsin, Hongkong, and Shanghai.

DATES AHEAD.

Minneapolis Electrical Show, Minneapolis, Minn., January 26, February 4.

Wisconsin State Telephone Association. Annual meeting, Madison, Wis., February 1 and 2.

National Independent Telephone Association, Annual Convention, Chicago, Ill., February 8, 9 and 10.

Philadelphia Electric Show, Philadelphia, Pa., February 13-27.

Missouri Electric, Gas, Street Railway and Water Works Association. Annual meeting, St. Louis, Mo., April 13, 14 and 15.

Iowa Electrical Association, Annual meeting, Davenport, Iowa, April 19, 20 and 21.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) January 10, 1911.

980,912 and 980,913. CLUSTER LAMP SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed December 28, 1907, and April 14, 1908. Extending circularly around the base are lamp-holding and contact rings so that a variable number of lamps may be placed at any desired points about the base.

980,921. LOADED PHANTOM CIRCUIT. George A. Campbell, Brooklyn, N. Y., and Thomas Shaw, Hackensack, N. J., assignors to American Telephone & Telegraph Company. Filed February 12, 1910. Two telephone lines are combined into an independent phantom circuit. Loading coils are included in each of the two-line circuits and the loading coil for the phantom circuit has a winding in each line wire and core common to all windings, so that the mutual inductance is added to the self-inductance.

980,926. TWO-BUTTON PENDENT SWITCH. Frank C. De Reamer, Schenectady, N. Y., assignor to General Electric Company. Filed October 2, 1907. Two depending switch buttons are connected to a yoke, which operates the switch blade.

980,940. ELECTRIC INDUCTION FURNACE. Carl Grunwald, Bredeney, Germany. Filed April 20, 1909. Has an auxiliary winding for counteracting the repelling effect of the primary winding upon the melting bath, and means electrically opposing and restricting the current induced in the auxiliary winding, disposed in such relation to the melting bath as to be without influence upon its equilibrium.

980,944. SUCTION CLEANER. Tracy Barbour Hatch, Alhambra, and Edwin Walter Goeser, Los Angeles, Cal. Filed September 27, 1909. In the rear part of a cylindrical casing is an electric motor directly connected to a pump immediately in front of it. The dust bag occupies the front drawbar.

980,945. ELECTRICAL BINDING POST. William Hector, Chicago, Ill., assignor to Automatic Electric Company, Chicago, Ill. Filed February 27, 1908. A sheet-metal post has a cylindric metal plug upon which the sheet metal forms a tight-fitting cover, and a clamping screw extending into the post thus formed.

980,979. ELECTRICAL REGENERATING CONTROL APPARATUS AND SYSTEM. James Colquhoun Macfarlane and Harry Burge, Arc Works, Chelmsford, England, assignors to Crompton & Company, Limited, Arc Works, Chelmsford, England. Filed February 7, 1910. Comprises a motor-generator set, a pair of motors connected in series with each other and with the generator of the set, a reversible shunt regulator for controlling the field of this generator, constant-excitation windings upon the pair of motors, and auxiliary shunt windings connecting these motors and automatically strengthened during decreasing speed and weakened during increasing speed.

980,986. ALTERNATING-CURRENT ELECTRIC MOTOR. Hans Sigismund Meyer, Bremen, Germany, assignor to General Electric Company. Filed August 22, 1906. An induction motor rotor has compound slots with tightly fitting iron bars in the inner portions thereof forming a short-circuited winding and copper bars in the outer portions of the slots and arranged to be short-circuited when the motor attains speed.

981,004. ELECTROPLATING APPARATUS. Marcellus Reid, Cleveland, O. Filed February 19, 1906. The anode consists of a central conducting stud in the lower portion of the tank, a series of spaced anode plates on the stud, and a cathode terminal surrounding the anode.

981,012. ELECTRIC CONTACT. Albert Schweiger, Itzling-Salzburg, Austria-Hungary. Filed April 8, 1909. A diverging pair of arms has hooks at its upper ends adapted to hang over an overhead line circuit. The lower ends of the arms extend to an insulated head at the top of a pipe protecting the wires.

981,015. PHANTOMED LOADED CIRCUIT. Thomas Shaw, Hackensack, N. J., assignor to American Telephone & Telegraph Company. Filed February 12, 1910. A modification of No. 980,921.

981,020. FIRE ALARM. Frederick D. Smenner, Fort Wayne, Ind. Filed September 9, 1908. A series of weighted arms is released by heat and actuates an electric alarm circuit.

981,027. CONNECTOR FOR ELECTRIC CONDUCTORS. George E. Stevens, Lynn, Mass., assignor to General Electric Company. Filed April 1, 1908. A connector plug has a porcelain body divided into two chambers containing each a metallic terminal adapted to be plugged into.

981,038. RENEWABLE FUSE FOR ELECTRIC CIRCUITS. Joseph A. Volk, Jr., South Norwalk, Conn. An inclosed fuse has a non-conducting cover with dove-tail recesses in its ends, end plates having lugs engaging the recesses by lateral movement and central holes and caps having central screws engaging the holes.

981,039. SELF-CENTERING ELECTRIC-FIXTURE SUPPORT. Joseph A. Volk, Jr., South Norwalk, Conn. Filed April 20, 1910. The attachment ring has arms supporting a socket in which the fixture head can be adjusted and locked.

981,057. ROTOR-COIL RETAINER. Arthur J. Brown and Robert B. Williamson, Milwaukee, Wis., assignor to Allis-Chalmers Company. Filed April 8, 1910. The rotating field coils of a synchronous machine are held in place by bracing members acting on adjacent sides of the coils. Adjustable tie rods fasten the braces together.

981,059. ROTARY CONVERTER. Joseph L. Burnham, Schenectady, N. Y., assignor to General Electric Company. Filed March 28, 1908. Alternate poles are provided with constant excitation; the others are connected in series with the armature, so as to shift the effective magnetization circumferentially and yield a variable direct-current voltage.

981,063. SWITCH FOR ELECTRIC CIRCUITS. Herbert W. Cheney, Norwood, O., assignor to Allis-Chalmers Company and Bullock Electric Manufacturing Company. Filed November 29, 1907. A rotable arm carries a movable contact which is brought into engagement with the fixed contact by one movement of a reciprocating arm and out of engagement by the opposite movement.

981,074. SPLIT-KNOB INSULATOR. Henry H. Dupont, Indianapolis, Ind. Filed April 14, 1910. A triangular insulator has wire-receiving grooves across each corner.

981,092. MAGNETIC SEPARATOR. August Kühn, Marchegg, near Vienna, Austria-Hungary. Filed May 27, 1909. A drum carries laminated magnetic pole pieces and means for energizing them.

981,102. ELECTROLYTIC DEVICE FOR GENERATING PURE OXYGEN AND HYDROGEN. René Moritz, Wasquehal, France. Filed September 17, 1909. Extensions on the electrodes are provided with holes for joining them together. A settling chamber at the bottom of the tank is arranged for draining off impurities from the electrolyte.

981,118. SAFETY APPLIANCE FOR ENGINE GOVERNORS. Hubert R. Rockwell, Mount Vernon, Ill., assignor of one-half to Thomas S. Boswell, Mount Vernon, Ill. Filed May 31, 1910. Electrical means are provided for disconnecting a latch and rotating the rocker arm.

981,120. TELEPHONE AND TELEGRAPH SYSTEM. Harry O. Rugh, Sandwich, Ill., assignor to Sandwich Electric Company, Sandwich, Ill. Filed June 26, 1908. A system for simultaneous telegraphy and telephony without interference.

981,121. AUTOMATIC ARC LAMP. Ernst Sailer, Rochester, N. Y., assignor to Bausch & Lomb Optical Company, Rochester, N. Y. Filed November 3, 1905. A self-feeding projecting lamp has its electrodes at right angles.

981,134. ROTARY CONVERTER. Charles P. Steinmetz, Schenectady, N. Y., assignor to General Electric Company. Filed March 20, 1909. Is provided with windings adapted to vary the flux distribution in the main poles so as to vary the relative amounts of the voltages at the commutator and collector rings. Also has unwound commutation poles at the points of commutation of the current flowing through the commutator.

981,152. DEVICE FOR INDICATING THE USEFUL PRESSURE IN ENGINES. Max Arndt, Aix-la-Chapelle, Germany. Filed March 3, 1909. An engine indicator is connected with an electrical measuring instrument through a series of resistances.

981,155. LIQUID HEATER. Henry E. Bandlow, Chicago, Ill. Filed October 3, 1910. An instantaneous electric water heater is provided with a heating chamber, faucet and reservoir.

981,164. RECORDING DOOR LOCK. Le Grand C. Bush, Chicago, Ill., and Joseph F. Cole, Elkhart, Ind., assignors of one-third to Walter J. Muller, Aurora, Ill. Filed June 1, 1910. Combined with a lock is a time-recording mechanism mounted outside the lock casing, electrically actuated means for operating the recording mechanism, a number of circuits for the electrically actuated means, and key-actuated circuit-closing means carried by the lock mechanism.

981,167. STREET-CAR INDICATOR. Stephen W. Chick, Los Angeles, Cal. Filed October 23, 1909. A series of display plates rests on an incline and the foremost of them, after being exposed, is moved electrically over the rest and to the rear.

981,178. SUBSTANCES TO BE USED AS VARNISHES AND FOR IMPREGNATION AND INSULATION AND METHOD FOR THEIR PRODUCTION. Gottlieb Gottfried Diesser, Zurich-Wollishofen, Switzerland. Filed August 14, 1908. The process of manufacture consists in causing the fatty acids of linseed oil to react upon carbohydrates at a temperature exceeding the limit of decomposition of the reacting substances present.

981,196. ELECTROPLATING APPARATUS. Sören Sanne Jacobsen, Beaver, Pa. Filed February 15, 1910. Comprises a tank, a pair of right and left supporting and feeding screws mounted transversely therein below the level of the solution in the tank, electrical connections to the screws, and mechanism for rotating the screws in opposite directions.

981,197. SYSTEM OF ELECTRICAL DISTRIBUTION. John W. Jepson, New York, N. Y., assignor to Gould Coupler Company. Filed August 29, 1905. Consists of a generator with voltage regulator, a storage battery and a charging booster therefor. The regulator automatically controls the connection of the battery to the load, the battery and booster to the generator for charging.

981,198. SYSTEM OF ELECTRICAL DISTRIBUTION. John W. Jepson, New York, N. Y., assignor to Gould Coupler Company. Filed April 30, 1906. A series and a potential coil in the booster circuit control, a rheostat in the generator field circuit.

981,207. HUSK FOR INCANDESCENT BULBS. Wilfrid Lumley, East Conneaut, O., assignor to The Conneaut Company. Filed January 27, 1906. Comprises a number of crossed metallic strips, each having a top portion provided with an intermediate offset portion and depending end portions.

981,209. ILLUMINATION SIGN. Charles A. McNeal, Newark, O. Filed February 10, 1909. A channel-form sign letter has a bottom plate and side walls of colored reflecting material and a number of electric lights in the channel.

981,229. OPERATING MEANS FOR VAPOR ELECTRIC DEVICES. Percy H. Thomas, East Orange, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed February 10, 1904. The temperature of the negative electrode of a mercury-arc lamp is increased by constricting the diameter of the tube directly above the negative electrode chamber.

981,233. ARC-LAMP CLEANER. Louis Wipfler, New York, N. Y. Filed March 31, 1910. A device for removing the deposit from flaming-arc lamps consists of a cup carrying an inverted central brush and two side brushes.

981,235 and 981,236. ELECTRIC METER. Harry N. Atwood, Lynn, Mass., assignor to General Electric Company. Filed August 20, 1908. A mercury type integrating watt-hour meter.

981,240. REFLECTOR SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed November 3, 1906. Has two opposite lamp-receiving sockets connected to the same base.

981,241. WEATHERPROOF PLURAL LAMP SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufactoring Company, Chicago, Ill. Filed April 8, 1907. A modification of the above in which the sockets are inclosed in a porcelain housing.

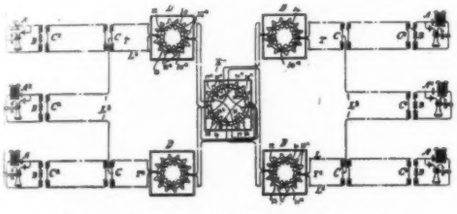
981,242. ELECTRIC LAMP SOCKET. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed February 17, 1908. The socket has side extensions to its casing for holding the supply wires, thus permitting the lamps to be connected side by side.

981,244. ELECTRIC WATER HEATER. Herbert A. Burns, Oakland, Cal., assignor to Diamond Electric Water Heater Company, San Francisco, Cal. Filed September 3, 1910. Has inner and outer cylindrical casings with a high-resistance coil between them.

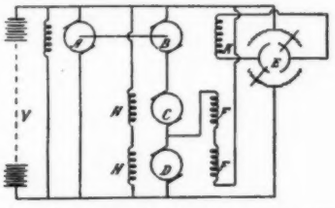
981,248. ELECTRIC-ARC LAMP. John T. H. Dempster, Schenectady, N. Y., assignor to General Electric Company. Filed May 31, 1902. A vertical-electrode flaming-arc lamp has a draft tube around the upper electrode whereby the arc is steadied and the deposits held within the lamp.

981,256. X-RAY APPARATUS. William S. Fullerton, St. Paul, Minn. Filed May 25, 1908. Comprises a standard which holds the lamp, by means of an extending arm, and allows it to be adjusted as desired.

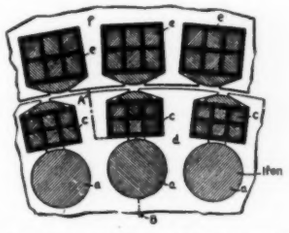
981,309. RAILWAY BOND WIRES. John B. Richardson and Thomas W. Meich, Somerville, N. J. Filed August 17, 1910. Two bond wires connect adjacent rails and the fish plate, one of the wires being applied at each end of the fish plate and connected electrically to the fish plate near its end and to the rail beyond the end of the fish plate.



980,921.—LOADED PHANTOM CIRCUIT.



980,979.—REGENERATIVE CONTROL SYSTEM.



980,986.—ROTOR CONSTRUCTION.

981,328. METHOD OF OPERATING VAPOR ELECTRIC DEVICES. Percy H. Thomas, Montclair, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Original application filed February 10, 1904. Divided and this application filed March 31, 1905. The method of operation consists in developing vapor from the vaporizable electrode, increasing its pressure and temperature in the immediate neighborhood of the electrode and permitting a relatively free flow of current in regions more remote from the electrode by there condensing excess.

981,334. ELECTRIC HEATING IRON. Harry Vanderpool, Turtle Creek, Pa., assignor to Braddock Ornamental Iron and Wire Works, Braddock, Pa. Filed March 19, 1910. An electric sad iron has a removable resistance unit provided with attached terminal connecting devices and shifting make-and-break switch mechanism for establishing variable currents through the resistance unit.

981,371. ELECTROLYTIC CELL. Frank H. Briggs, Elyria, O. Filed June 22, 1910. Has two electrodes connected respectively to the positive and negative poles of a source of electricity, the negative electrode being formed with slanting sides which meet in a point at the upper part, the bottom of the electrode being closed.

981,399. TELEPHONE TRUNKING SYSTEM. Alfred H. Dyson, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company. Filed January 22, 1907. Includes a calling line, a signal at the exchange displayed responsive to currents controlled at the substation of the line, a plurality of distributing devices individual to the signal, and automatically controlled mechanism operated responsive to the actuation of particular ones of the devices selected by the operator for extending the circuit of the line to predetermined points.

981,406. MULTIPLEX TELEGRAPHY. Reginald A. Fessenden, Washington, D. C. Filed January 4, 1906. One wire is used to transmit a number of messages, the impulses sent over the line having a different periodicity, each receiving station being attuned to its own sending station.

981,432. ELECTRIC IGNITER. Johann Krannichfeldt, Cologne, Germany. Filed July 15, 1908. An electric igniter is enclosed in a water-tight tube.

981,447. ILLUMINATING INSTRUMENT. Howard T. Martin and James F. Golden, Baltimore, Md. Filed December 27, 1909. A miniature electric light is placed in an instrument which has at one end a holder and at the other end a closed glass tube.

981,452. ELECTRIC SWITCH. Philip Thos. McNally, Mandan, N. D. Filed December 21, 1909. Comprises a snap switch with a pair of low contacts and a high contact. The switch is provided with a three-point detent for limiting the movement of the switch arms to 120 degrees.

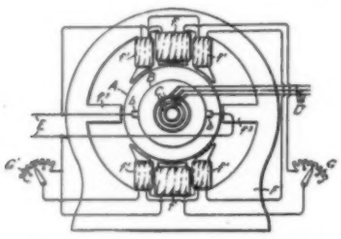
981,463. INTERLOCKING MECHANISM FOR ELEVATORS. John S. Muckle, Philadelphia, Pa. Filed May 18, 1910. The electrical connections are so made that when an elevator door is open the car cannot be operated.

981,464. WALL-PAPER PERFORATOR. Thomas J. Nash, Lincoln, Neb., assignor to Capital Novelty Company, Lincoln, Neb. Filed April 16, 1910. The needle of a wall-paper perforator is operated by an electric motor.

981,497. METHOD OF REMOVING DELETERIOUS GASES. Percy H. Thomas, East Orange, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Filed January 23, 1904. Comprises a means for mechanically removing the injurious mercury-vapor and other gases generated in the manufacture of mercury-vapor lamps.

981,498. VACUUM APPARATUS. Percy H. Thomas, Montclair, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Original application filed January 23, 1904. Divided and this application filed June 16, 1905. Relates to means for the manufacture of mercury-vapor lamps, etc.

981,503. VACUUM DISCHARGE GAP FOR PRODUCING ELECTRICAL OSCILLATIONS. Harry F. Waite, Harrison, N. Y. Filed May 10, 1910. A spark gap for wireless telegraphy com-



981,134.—ROTARY CONVERTER.

prises exhaust chambers provided with solid electrodes and with liquid electrodes, and series connections between a number of the chambers uniting their solid electrodes.

981,531. ELECTRIC-LIGHT SHADE. Clifford C. Carpenter, Seattle, Wash. Filed July 26, 1910. Describes an adjustable lamp shade.

981,535. TROLLEY POLE. Frederick L. Cross, Annapolis, Md., assignor of one-half to Harry Ira Geesey, Altoona, Pa. Filed July 6, 1909. A trolley pole is made with a flattened elliptical cross section, but flared into a circular cross section at the ends.

981,545. MOTOR LEADS CONNECTION FOR STREET CARS. Harry Etheridge, Zellienople, Pa., assignor of one-half to Russell H. Boggs, Pittsburg, Pa. Filed May 13, 1909. The motor leads are carried through conduits attached to the car body.

981,552. APPARATUS FOR MEASURING AREAS BY MEANS OF ELECTRIC-RESISTANCE COILS. Julius Josef Götz, Offenbach-on-the-Main, Germany. Filed April 15, 1907. A number of the symmetrically-arranged contacts are raised when the device is placed over the object to be measured. The area is then computed from the resistance which these contacts insert in the circuit.

981,553. INSULATING COVER FOR ELECTRIC SWITCHES. Monroe Guett, Hartford, Conn., assignor to the Hart & Hegeman Manufacturing Company, Hartford, Conn. Filed March 24, 1910. In an electric switch the combination with a receptacle and top plate, of brackets extending laterally from both sides of the top plate, an upstanding pin on each bracket, closures filling the space between the top plate and the side walls of the receptacle apertured to receive the pins, and means for removably securing the closures in place.

981,572. RHEOSTAT. Charles D. Kestner, New York, N. Y., assignor to Meyrowitz Manufacturing Company. Filed December 31, 1909. Comprises a tapered coil, flattened upon one side, a revoluble arbor disposed substantially at right angles to the axis of the coil, and an arm carried by the arbor and having a protuberance adapted to resiliently engage various portions of the flattened portion.

981,579. ELECTRIC MOTOR CONTROLLING APPARATUS. Harry Ward Leonard, Bronxville, N. Y. Original application filed January 23, 1905. Renewed February 20, 1907. Divided and this application filed May 11, 1909. Combined with a resistance for controlling the armature circuit of the motor is a resistance for controlling its field strength, and means for insuring starting of the motor only with a field of proper strength, this means comprising an electroresponsive winding connected across the field resistance.

981,585. SHADE AND REFLECTOR FOR ELECTRIC LAMPS. Edward P. Mitchell, Conneaut, O., assignor to Cleveland Gas & Electric Fixture Company, Cleveland, O. Filed January 27, 1909. Renewed December 1, 1910. An electric lamp fixture comprises a supporting stem, this stem carrying a lamp socket and a reflector holder adjustable relatively to each other, a spider on the stem, and a shell secured to the spider, the lower edge of the shell closely approaching the reflector holder.

981,586. LAMP HOLDER. Thomas B. Monosmith, Bay City, Mich. Filed June 1, 1909. Comprises a lamp receiving receptacle and a tubular member for clamping the lamp cord.

981,595. CONTACT MAKING AND BREAKING DEVICE. Jacob Lundgren, Philadelphia, Pa. Filed June 18, 1908. A point, normally out of contact, is intermittently put in contact by means of a revolving cam.

981,599. CONTACT-BREAKER FOR MAGNETO-ELECTRIC IGNITING APPARATUS. Gustav Adolf Unterberg, Durlach, Germany. Filed April 20, 1909. The contact breaker has a nonyielding lever carrying a stationary contact, a movable contact and means for supporting the same, springs for normally holding the movable contact against the stationary one, consisting of two semicircular pieces having their ends bent round backwardly, a magneto shaft and two insulating disks to clamp the ends of the pieces to the shaft.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office, Washington, D. C.) that expired January 16, 1911:

512,687. ELECTRICAL LIMITING TIME-INTERVAL CLAMP OR BRAKE. Allen W. Dow, New York, and Thomas R. Griffith, Brooklyn, N. Y.

512,711. RAIL-BOND CONNECTOR FOR ELECTRIC RAILWAYS. Herbert R. Keithley, Chicago, Ill.

512,723. ELECTRIC INHALER. Reubin L. Larcom, Fandon, Ill.

512,757. PROCESS OF MAKING SECONDARY-BATTERY PLATES. Willian L. Silvey, Dayton, Ohio.

512,769. MACHINE FOR WINDING ELECTRO-MAGNETS. Richard Varley, Jr., Englewood, N. J.

512,774. ELECTRIC SWITCH. Ernest P. Warner, Chicago, Ill.

512,797. ELECTRIC HEATER. William J. Bowen, Norwalk, Ohio.

512,805. SWITCHBOARD. William A. Childs, Englewood, N. J.

512,820. MOTOR-GENERATOR. John C. Henry, Westfield, N. J.

512,821. CEILING FAN-MOTOR. William Hochhausen, Brooklyn, N. Y.

512,823. SECONDARY BATTERY. Arthur Hough, San Francisco, Cal.

512,843. DYNAMO-ELECTRIC MACHINE OR MOTOR. Howard S. Rodgers, Hartford, Conn.

512,848. CHAIN-MAKING MACHINE. Elihu Thomson, Swampscott and Charles E. Harthan, Lynn, Mass.

512,853. COMMUTATOR AND CONNECTION FOR DYNAMOS. Gilbert Wilkes, Detroit, Mich.

512,872. SEXTUPLEX TELEGRAPH. Thomas A Edison, Menlo Park, N. Y.

512,880. ELECTRIC ARC LAMP. Charles J. Hartley, Decatur, Ill.

512,888. TROLLEY-WIRE INSULATOR. Henry H. Luscomb, Hartford, Conn.

512,907. BATTERY SYSTEM FOR ELECTRIC RAILWAYS. Leslie B. Rowley, Ashland, Wis.

512,923. ELECTRIC RAILWAY TROLLEY. Walter Van Benthuysen, New Orleans, La.

512,970. ELECTRIC WASHING MACHINE. John P. Johanson, New York, N. Y.

513,006. CONTINUOUS ELECTRIC CURRENT DISTRIBUTING SYSTEM. Michael Von Dolivo- Dobrowolsky, Berlin, Germany.

513,023. ELECTRIC RAILWAY TROLLEY. George W. Mac Kenzie, Beaver, Pa.

513,051. APPARATUS TO CONTROL THE STROKES OF PISTON-RODS ELECTRICALLY. Charles E. Ongley, New York, N. Y.

513,052. ELECTRIC SEARCH-LIGHT. Charles E. Ongley, New York, N. Y.

513,062. AUTOMATIC REGULATOR FOR DYNAMO-ELECTRIC MACHINES. Elmer A. Sperry, Cleveland, Ohio, and George E. Mills, Ravenswood, Ill.

513,065. AUTOMATIC ELECTRO-MAGNETIC SWITCH. Herbert P. White, Philadelphia, Pa.

513,066. MEANS FOR ADJUSTING ELECTRIC LAMPS. Niels M. Andersen, Omaha, Nebr.